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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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74-2767. Russell, V. S. (Dept. Forest., Australian Nat. Univ., Canberra, ACT Australia). **Pollution: concept and definition.** *Biol. Conserv. 6(3): 157-161; 1974.* (26 references)

The meaning of the term, pollution, is discussed; restriction of the term to include only activities of man is recommended. Definitions of water pollution, air and soil pollution, visual pollution, noise pollution, and thermal pollution are discussed. It is pointed out that there are many thousands of synthetic compounds developed for purposes other than pesticidal. These substances are often toxic and yet are subject to less strict legislative control than pesticides. The polychlorinated biphenyls, for example, with properties similar to DDT, have been used since about 1930. Certain heavy metals, such as zinc, copper, and cadmium, have been found to produce adverse biological effects at levels much lower than were previously considered toxic.

74-2768. Beaton, M. (Author address not given). **The National Health and Welfare Survey: the facts are poisonous.** *Can. Hosp. 52: 25-26; 1973.* (1 reference)

Pesticides have improved the quantity and quality of agricultural goods in Canada. The Health Protection Branch, working with the Canada Department of Agriculture, oversees the use of pesticides. A product must be registered with the Department before it can be sold for use on a food crop or in an area where food is handled or processed. The conditions of use may be modified by the Department which may also establish residue tolerance levels. These levels are established in such a way as to be consistent with good agricultural practices, although in many cases the probable safe level may be considerably higher. Products with excessive residues are prevented from reaching the market, or, if already on the market, they are removed or diverted to processing if such processing can remove the residue. In the case of imported foods, they are refused entry. The permissible daily intake for man is usually based on chronic toxicity studies in animals. The Health Protection Branch is involved in research concerning the development of new analytical methods to detect and control pesticide residues and the evaluation of pesticide residues in the average meal as consumed by Canadian families.

74-2769. Koelling, K. (Inst. fuer Tierphysiol., Munich University, Munich, Germany). **Ist der Einsatz von Bioziden in der Nahrungsmittelproduktion trotz verschiedener Risiken fuer die Umwelt gerechtfertigt? [Is employment of biocides in food production justified in spite of various risks for the environment?]** *Ernaehrungsumschau 21(5): 139-141; 1974.* (German)

General problems of the use of pesticides in agriculture and presence of pesticides in food are described. While pesticides are prerequisite in food production at acceptable costs, chemical pest control should be only a part of the complex measures. Recent studies indicate no immediate hazards of pesticide use and food contamination for man. The acceptable daily intake, determined for pesticides on the basis of the maximum no-effect level established in chronic poisoning tests, usually using a safety factor of 100, guarantees the absence of harmful effects of pesticide residues on human health, and further serves to standardize the maximum allowable residue levels in foods.

74-2770. Chegrinets, G. Ya. (A.N. Marzeyev Sci. Res. Inst. General and Communal Hyg., Kiev, USSR). **Po povodu stat'i N. N. Krasyuk, V. N. Zhulenko i R. V. Stavitskogo "K voprosu o migratsii rtuti, soderzhashcheysya v nekotorykh pestitsidakh, v biologicheskikh tsepyakh". [Reply to article by N. N. Krasyuk, V. N. Zhulenko and R. V. Stavitskiy "Migration of mercury, present in some pesticides, in biological objects".]** *Gig. Sanit. 39(5): 93-94, 1974.* (11 references) (Russian)

Problems of environmental contamination and the migration along trophic chains of mercury are discussed with regard to organomercurial fungicides. Mercury, released primarily into the atmosphere and into water bodies, may accumulate in the trophic chains, first in algae and plankton, and finally reach concentrations in fish which may be toxic to humans. Mercury in benthic sediments is highly persistent and can be gradually converted into water-soluble compounds by microorganisms. Prevention of environmental contamination with mercury requires the replacement of organomercurial fungicides as seed-dressing agents by other, less harmful preparations. (See Abstract No. 73-1045). However, this measure should be regarded as only one of the necessary measures to be taken in view of the increasing consumption and the commensurately increasing emission of mercury by different industries.

74-2771. Sherman, R. W. (1713 Luzerne Ave., Silver Spring, MD 20910). **"Artifacts" and "mimics" of DDT and other organochlorine insecticides.** *J. N. Y. Entomol. Soc. 81(3): 152-163; 1973.* (17 references)

A selective review of relevant world literature concerning the existence of artifacts and mimics of DDT and other organochlorines is presented. The presence of such artifacts (extraneous substances occurring in nature) and mimics (simulants) was previously obscured by the interferences inherent in the early colorimetric and total chlorine analytical methods employed prior to the advent of the gas-liquid chromatograph. The artifacts and mimics are masked by DDT if it is present, and they give identical analytical reactions when the two pioneer analytical methods are used. In 1966, it was disclosed that polychlorinated biphenyls (PCBs) are widespread in the ecosystem; PCBs simulate DDT. This discovery negated the putative data which was the basis for previous alleged sensational charges against DDT. Illustrations of charts obtained from gas-liquid chroma-

tographic analyses of pre-DDT origin soil and PCBs are presented; they show the presence of artifacts and mimics for which, prior to 1966, DDT was the scapegoat.

74-2772. McKim, J. M.; Christensen, G. M.; Tucker, J. H.; Benit, D. A.; Lewis, M. J. (Nat. Water Qual. Contr. Lab., Duluth, MN). **Effects of pollution on freshwater fish.** *J. Water Pollut. Cont. Fed. 46(6): 1540-1591; 1974.* (416 references)

This literature review includes sections on the effect of pesticides on the aquatic environment and the food chain; environmetal indicators of pesticides; pest control management; degradation of atrazine, captan, carbaryl, diazinon, 2,4-DB, malathion, methoxychlor, parathion, polychlorinated biphenyls, and toxaphene; DDT effects on freshwater fish; and toxicity of Dowpon (dalapon), diuron, sodium trichloroacetate, 2,4-D, and methyl mercury. Procedures and apparatus for pesticide analysis in water, air, animal tissues, sediment and food are reviewed, as are studies of pollution by many insecticides, herbicides, and piscicides. Other topics covered were effects of carbonate and phosphate detergents; chlorine residues; metal ions; salinity and oxygen; and industrial, domestic, and radioactive pollutants. A table summarizes acute and chronic toxicity of organic and inorganic pollutants to many species of freshwater fish.

74-2773. Flamm, W. G. (Div. Toxicol., Food Drug Admin., Dept. Health, Educ., Welfare, Washington, D.C. 20204). **A tier system approach to mutagen testing.** *Mutat. Res. 26(4): 329-333; 1974.* (20 references)

A hierarchical system of tests called the tier system can be used to reduce unwitting exposures to genetically hazardous materials at the earliest possible time. It is impossible to fully test every new compound which is introduced into the environment, and even a battery of tests can fail to indict compounds genetically hazardous to man. Use of the tier testing system can aid in setting priorities. The first tier, the prescreen, must be sufficiently broad, yet rapid and inexpensive, to alert the investigator to any and all potential mutagens. This tier uses microbial organisms. Substances found mutagenic at this level can be tested (tier two) on mammalian tissue culture cells and Drosophila and might also use the heritable translocation test. Substances positive in the first two tiers are considered qualitative mutagens and are tested in the third tier for risk under defined conditions. This would require thousands of F1 progeny of intact animals treated at human use and exposure levels.

74-2774. Ramel, C. (Univ. Stockholn, Wallenberg Lab., Stockholm 50, Sweden). **The mercury problem—a trigger for environmental pollution control.** *Mutat. Res. 26(4): 341-348; 1974.* (14 references)

The first report of the mercury problem in Sweden was in the 1950's and involved seed-eating birds. The possibility for human exposure involved eggs with mercury levels above the limit set by WHO for foodstuffs. Mercury pollution from industry caused high concentrations of mercury in pike. This was particularly alarming since it was found to be in the methylmercury form, the same form which had caused Minamata disease in Japan. In 1966, it was declared that fish with a mercury content higher than 1 mg/kg was prohibited for sale. In 1967, fishing in waters where such fish were caught was prohibited. Also in 1967, use of mercury as a seed dressing was prohibited. A committee was appointed in 1968 to evaluate toxicological and epidemiological risks for the Swedish population from methyl mercury. Screening of extreme fish-eaters in Sweden showed they had already reached levels causing intoxications in Japan. However, no case of Minamata disease was recorded in Sweden. Toxicological, genetic, and teratological effects of methyl mercury are discussed.

74-2775. Wilson, J. (Author address not given). **Verdict on DDT.** *Nature (London) 250(5468): 691-692; 1974.*

It is obvious that use of DDT has saved the lives of millions of people who would otherwise have died from malaria, typhus, and other insect-borne diseases. However, the beginning of the pesticide's downfall occurred in 1949 when the DDT derivative was used against mosquitoes in Clear Lake, California. By 1954, the population of a rare grebe on the lake had dropped alarmingly, and the DDT derivative was blamed. Further investigations resulted in the ban of DDT in the United States. However, much evidence on DDT is controversial. It is said that the pesticide circulates in the air and soil, ultimately contaminating the sea, but workers from the Woods Hole Oceanographic Institute were unable to find it there. DDT distended the livers of mice and was said to lower their tolerance to some chemicals such as carbon tetrachloride, but it actually increased their resistance to others such as aflatoxin. However, there was no doubt that DDT was the cause of death due to eggshell thinning in birds and increased mortality in fish eggs. Montrose Chemicals, the only factory in the country still producing DDT, has workers who are constantly exposed to high levels of DDT. If there is any truth in the charge that DDT is carcinogenic, then cancer should be found there. However, these workers have a lower incidence of cancer than normal. Nature itself may be passing final judgment on the use of DDT as many insects appear to be becoming immune to its effects.

74-2776. Biliotti, E. (Dept. Zool., Inst. Nat. Recherches Appliquees, France). **Quelques aspects de la lutte biologique et de la lutte integree contre les insectes. [Some aspects of biological and integrated control of insects.]** *Rev. Pathol. Comp. Med. Exp. 74(11): 40; 1974.* (French)

The increased and almost exclusive use of insecti-

cides for insect control has resulted in the evolution of resistant species, increased pesticide expenditures, and more or less long-term toxicological hazards for man. These developments now increasingly require the application of integrated insect control by the use of entomophagous insects and pathogens of the insects to be controlled.

74-2777. Anonymous. **Reflections on DDT.** *R. I. Med. J. 57: 70-71; 1974.*

The publication of Rachel Carson's *Silent Spring* and pressures from ecological and environmental enthusiasts culminated in an EPA order almost totally banning the use of DDT as a pesticide in the United States. While there have been some benefits from the withdrawal of DDT (such as the revival of some endangered species and the leaching out of DDT from some food chains), the record is not at all unequivocal at this time. Some have said that without agricultural chemicals such as DDT starvation and worldwide chaos will be inevitable. WHO stated that DDT has no known substitute for the control of malaria, typhus, and other insect-borne diseases. Without DDT vegetables and fruits will once again have insect debris, wormy parts, and blemishes. The organophosphates recommended as DDT substitutes are toxic to bees, thus interfering with the pollination of crops and the production of honey. Heavy infestations of mosquitoes, inchworms, and gypsy moths have followed the banning of DDT. It is unlikely that the U. S. will remain a DDT-free island in a world where most other countries depend on its use as a life-or-death matter.

74-2778. Biever, K. D. (USDA, Biol. Control Lab., Columbia, MO). **Biological control of insects.** *Trans. Mo. Acad. Sci. 6: 165-166; 1972.*

The use of beneficial organisms to regulate population densities of noxious organisms began, in the United States, in 1888, when the Vadalia beetle, *Rodolia cardenalis* (Muls.), was introduced from Australia for the cottony cushion scale *Icerya purchasi* Masic on citrus in California. Research in this area has contributed much understanding of the ecological principles involved in using natural enemies and the relationships between these organisms and their host insects. Pests currently under study include the alfalfa weevil, *Hypera postica*, as well as the cereal leaf beetle, the pea aphid, Rhodesgrass scale, and the cotton bollworms. Insect pathogens show great promise as microbial insecticides although commercial availability is limited to two developed from bacteria. Two pest management systems which minimize the use of insecticides have been developed for controlling the pests in cabbage. One system employs microbial insecticides applied as needed, and the other involves utilization of parasites.

74-2779. Fairchild, M. L. (Entomol. Dept., Univ. Missouri, Columbia, MO). **A critical examination of pesticides and pesticide regulation.** *Trans. Mo. Acad. Sci. 6: 166-167; 1972.*

Whenever pesticides are used, poison is added to the environment. Before pesticides are released for use, they are critically reviewed and their toxicological and pharmacological effects studied in detail. Use of sophisticated instrumentation makes additional information available on compounds which have already been in use for some time. Of course, this data is subject to human interpretation, and the public must rely upon scientists to properly interpret the information at hand. A question of great significance comes to light after such interpretation has been made; this is whether decisions affecting the fate of a pesticide should be made by the legal community and laymen or by a cross section of the scientific community.

74-2780. Johnson, W. W. (Fish-Pesticide Res. Lab., Columbia, MO). **Pesticides and the aquatic environment.** *Trans. Mo. Acad. Sci. 6: 166; 1972.*

Problems of pesticides in the aquatic environment are presented in relation to pesticide types and application procedures. The different categories of pesticides are presented according to the kind of pest controlled and chemical type. The mode of application is considered relative to the potential for aquatic contamination. Effects on aquatic organisms are reviewed under acute toxicity, chronic toxicity, reproduction, growth, biological magnification, pesticide interactions, and the development of resistance. A brief summary of the relation between the beneficial aspects of pesticide use versus the potential hazard to the environment is given.

74-2781. Knote, C. E. (Cape-Kil Chem. Co., Cape Girardeau, MO). **The great trial of science and scientists.** *Trans. Mo. Acad. Sci. 6: 167; 1972.*

If the safe use of chemical insecticides is banned, disease, plague, and famine face the United States in 10 to 15 years. An unrealistic, hysterical, and political approach to pesticide control has been brought about by misinformation presented in news media by unscientifically trained people. Good scientific data has been grossly misinterpreted by Federal Agencies. Major chemical firms are refusing to invest the necessary 3 to 16 million dollars to research a new chemical on the grounds that a Federal Agency could ban the product based on test results using enormous amounts of the new substance before the company has secured returns equalling the initial research investment. After extensive investigation of insecticides, the National Academy of Sciences has stated that there is probably no other class of chemicals or drugs so extensively studied and tested, and whose preparation, qualities, uses, and toxic properties are so fully known, that can be used as safely and effectively. It is suggested that unless non-scientific bans

and unrealistic regulation of pesticides are stopped the United States could face a time where starvation and disease are a way of life for millions of people.

74-2782. Wicklund, J. (Insecticides-Pesticides Region VII, EPA, Kansas City, MO). **EPA pesticide policies and regulations.** *Trans. Mo. Acad. Sci. 6: 167; 1972.*

As of December 2, 1970, the function of enforcement of federal laws regarding pesticides was transferred from USDA to EPA by Executive Order. The concept of federal pesticide control changed even during the first year of the new agency's existence under its broad mandate to control pollution of the environment. The number of pesticides under critical review, an open approach to public and professional participation in cancellation procedures, and a more vigorous attitude in enforcement, are parts of the EPA pesticides program. Inclusion of enforcement, registration, residue tolerance, and human effect studies under a single agency resulted in a coordinated effort.

74-2783. Anonymous. **Communicable diseases and vector control in 1972.** *WHO Chronicle 27(7/8): 301-313; 1973.* (4 references)

Resistance to insecticides including DDT, dieldrin, and malathion has been reported regarding insects detrimental to public health. Insecticide-resistant strains of houseflies and other species have even developed a certain cross-tolerance to juvenile hormone analogues recently used for insect control. The WHO program for evaluating new insecticides tested 68 compounds in the initial screening stage during 1972; 9 compounds were tested in laboratory and simulated field tests. Fewer compounds of the conventional insecticide type are currently being produced. The production goal is usually a biodegradable chemical with residual activity which would not accumulate in wildlife and the environment. Synthetic analogues affecting the growth and metamorphosis of insects are being tested in addition to insecticides. Safety studies are a part of all stages of the WHO program for insecticide evaluation. During laboratory tests the chemicals are tested for oral and dermal toxicity to animals, and those presenting a possible hazard to humans are disallowed. During village-scale trials a medical toxicologist is present to determine if any special precautions are needed. The possible long-term effects of DDT on malaria eradication spraymen in Brazil are still under study. Research confirmed that continuous feeding of DDT to two strains of lab mice over their entire life span resulted in increased incidence of hepatomas. However, no correlation could be established between patterns of cancer incidence and levels of DDT and its metabolites found in human fat.

74-2784. Maltais, B.; Metitiri, P. O.; Bolduc, R. (Fac. Sci. Agr. Aliment., Univ. Laval, Quebec, Canada). **Variation saisonniere dans les concentrations des substances organohalogenees dans les eaux de drainage du bassin de la riviere des Roches. [Seasonal variation in the concentrations of halogenated organic substances in drainage water of the Roches river basin.]** *ACFAS (Ass. Can. Fr. Av. Sci.) 39: 5; 1972.* (French)

The influence of modern farming on the water of the Roches river which drains an agricultural area of about 5 sq miles in Canada was studied. Seasonal variations in organochlorine pesticide residues in the Roches were also examined. Four organochlorines were detected in the river water. The residue concentrations were highest during August and lowest during October and November; residue levels measured in winter when the water level is lowest nearly equaled summer levels. Residue concentrations were also high during the flood period in March.

74-2785. Burns, J. E.; Miller, F. M.; Gomes, E. D.; Albert, R. A. (Inst. of Environmental Med., New York Univ. Med. Cent., New York, NY 10016). **Hexachlorobenzene exposure from contaminated DCPA in vegetable spraymen.** *Arch. Environ. Health 29(4): 192-194; 1974.* (12 references)

Hexachlorobenzene (HCB) blood residues were found in 19 of 20 vegetable spraymen exposed to HCB-contaminated dimethyl-1-2,3,5,6-tetrachloroterephthalate (DCPA). The mean level was 40 ± 63 parts per billion (ppb) with a range of 0 to 310 ppb. No definite physical or biochemical effects of this exposure were discovered. Specifically there was no evidence of cutaneous porphyria or abnormalities of uroporphyrin or coproporphyrin excretion. A positive correlation ($P<.05$) was found for HCB levels and δ-aminolevulinic acid excretion, but this was interpreted skeptically. (Author abstract by permission)

74-2786. Burton, W. B.; Pollard, G. E. (Shell Develop. Co., Biol. Sci. Res. Cent., Modesto, CA). **Rate of photochemical isomerization of endrin in sunlight.** *Bull. Environ. Contam. Toxicol. 12(1): 113-116; 1974.* (6 references)

Ten mg samples of endrin in the solid state as thin layers in glass planchets were exposed to natural sunlight in June and in October. Products were separated by chromatography on Florisil and analyzed by infrared spectroscopy. Conversion was primarily to the pentacyclic' ketone 1,8-*exo*-9,10,11,11-hexachloropentacyclo $(6.2.1.1^{3,6}.0^{2,7}.0^{4,10})$dodecan-5-one (II) plus minor amounts of 4,5,6,7,8,8-hexachloro-4,7-methano-3,5,6-methenoindan-1-carboxaldehyde. Conversion varied with the intensity of sunlight. After five days exposure in October, 14% was converted to II while conversion was 46% in June. After 12 days exposure, the amounts were 30 and 65% respectively. Endrin was 50% isomerized to II in 7±2 days in intense summer sun with complete conversion in 17±2 days.

74-2787. Tanji, K. K.; Biggar, J. W.; Mehran, M.; Cheung, M. W.; Henderson, D. W. (Exp. Sta., Univ. California, Davis, CA). **Herbicide persistence and movement studies with molinate in rice irrigation management.** *Calif. Agr. 28(5): 10-12; 1974.*

Experiments were conducted to determine the persistence and movement of molinate in strip plots (25 X 200 ft) under static, flow-through, and recycled systems of water management. In preflood, preplant applications of molinate the herbicide was incorporated 3 inches deep into dry soil with a spring-tooth harrow. The persistence of molinate incorporated this way was about 3 to 5 days. Regardless of the water management system, molinate was found in only trace amounts in flood-water samples. However, with respect to seepage waters, molinate persisted for at least 4 months. Samples for these tests were drawn from 5 cm and 20 cm in the submerged soils. This long persistence at low concentration levels in submerged soils is probably due to anaerobic conditions which prevent aerobic microbes from degrading the chemical. Molinate may also interact with soil and organic matter thereby rendering it unavailable for microbial degradation. When the chemical was uniformly broadcast on flood waters, it was redistributed by downstream flow within half a day. The top half of plots flooded by the flow-through system had dropped in molinate concentration. In flood waters of the recycled system, however, the herbicide concentration remained more uniform since flood waters containing higher concentrations of molinate at the lower end of the plot were recirculated to the inflow end and reapplied. In a static water management system when the liquid formulation of molinate was applied as a post-flood treatment, the concentrations in the flood waters remained at relatively high concentrations for more than ten days.

74-2788. MacGregor, J. S. (Nat. Marine Fisheries Service, Southwest Fisheries Cent., La Jolla, CA). **Pesticide research at the Fishery-Oceanography Center.** *Calif. Mar. Res. Comm. 16: 103-106; 1972.* (3 references)

Pesticide research has recently started at the Fishery-Oceanography Center and is expected to center along two main lines: first, the effect of pesticides on the reproductive metabolism of fish and the survival of eggs and larvae; second, an investigation of residues in plankton, current and historical. It is thought possible that some fish in California coastal waters contain pesticide residues so high as to prevent effective reproduction. One sample of rockfish (*Sebastodes rosaceous*) studied at these labs contained 10 ppm DDT and metabolites in the liver and had 3.6 ppm in the ovaries. A sample of *Sebastodes serriceps* contained 7.3 ppm in the

liver and 4.3 ppm in the ovaries. More than 80% of the total was DDT derivatives. In a series of tests on frozen plankton samples taken from about 400 miles along the line running southwest from Santa Mónica, pesticide residues were higher for the two inshore stations and decreased offshore except for one high value in the shallows off San Nicolas Island. Most of the samples showed very low pesticide levels or no detectable level at all. The constituents of the plankton samples were primarily crustaceans, ctenophores, and salps. Inclusion of fish larvae or small fishes in the sample increased the pesticide residues noticeably. Myctophids weighing 0.3-0.5 g contained more than 100 times as much pesticide residue as the plankton samples from which they were removed.

74-2789. Grover, R.; Smith, A. E. (Res. Sta., Agr. Canada, Regina, Saskatchewan, Canada). **Adsorption studies with the acid and dimethylamine forms of 2,4-D and dicamba.** *Can. J. Soil. Sci. 54: 179-186; 1974.* (8 references)

The adsorption of acid and dimethylamine salts of 2,4-D and dicamba was studied on Canadian prairie soils and various other adsorbents, using slurry-type adsorption experiments. The amount of adsorption of both the acid and dimethylamine forms of the two herbicides was minimal. The results were explained on the basis of dissociation of the acidic and dimethylamine salts to the respective anionic forms in the near-neutral prairie soils. This conclusion was supported by (1) the strong adsorption of these herbicides to the anion-exchange resin but not to the cation-exchange resin; (2) the strong adsorption of the ^{14}C-dimethylamine cation to these soils; and (3) the leaching patterns of the ^{14}C-dimethylamine salts of both herbicides from soils and resins. Only the anionic species were eluted from columns containing soils and cation-exchange resin whereas only the ^{14}C-dimethylamine cation eluted from columns containing anion-exchange resin. Both forms of 2,4-D and dicamba were strongly adsorbed to activated charcoal, cellulose triacetate, and peat. There was little or no adsorption of these herbicides to montmorillonite and kaolinitic clays, cellulose powder, or wheat straw. (Author abstract by permission)

74-2790. Lockwood, L. M.; Majumder, S. K.; Lineback, D. R. (Dept. Grain Sci. Ind., Kansas State Univ., Manhattan, KS). **Degradation of organophosphate pesticides in cereal grains during milling and cooking in India.** *Cereal Sci. Today 19(8):330-333, 346; 1974.* (9 references)

Samples of paddy (rough rice), wheat, and sorghum were treated with different concentrations of malathion, tetrachlorvinphos (Gardona), and fenitrothion (Sumithion) for protection against insect infestation during storage. Subsequently, the samples were milled, cooked, and analyzed by gas-liquid chromatography for residues remaining in the final product. Malathion and Gardona treatments ranged from 10-80 ppm; Sumithion treatments ranged from 2-16 ppm. During machine milling the residues in the wheat and sorghum decreased 30-70%; because the residues were concentrated in the hull and bran of the paddy, relatively little remained on the polished rice after milling. Even with treatments of 80 ppm residues on the polished rice were never more than 4 ppm. Milled products from each grain were cooked using traditional Indian methods. Preparations involving boiling or steaming (wet cooking) resulted in the complete degradation (loss) of residues of all three pesticides. Dry cooking methods, used in preparing chapatties from the wheat and sorghum, resulted in average losses of 43-75% of the residues.

74-2791. Schuphan, I. (Inst. fuer Pflanzenschutzmittelforschung, Biol. Bundesanstalt, Berlin, Germany). **Zum Metabolismus von Phenylharnstoffen. II. Abbau und Metabolismus von Monolinuron-*O*-methyl ^{14}C im Boden. [Metabolism of phenylureas. 2. Degradation and metabolism of monolinuron-*O*-methyl ^{14}C in soil.]** *Chemosphere 3(3): 127-130; 1974.* (12 references) (German)

The metabolism of monolinuron-*O*-methyl ^{14}C was studied in sterilized and non-sterilized sandy loam. Production of carbon dioxide at a rate of 58% in non-sterilized soil and at 9% in sterilized soil was determined after one year. The respective percentages of radioactive *N,O*-dimethylhydroxylamine found in sterilized and non-sterilized soil were 28% and 8%. The findings indicate hydrolysis of the amide bond parallel with the demethylation reaction. While *N,O*-dimethylhydroxylamine accumulated in sterilized soil, the release of *N,O*-dimethylhydroxylamine in non-sterilized soil was accompanied by oxidative decomposition indicated by CO_2 liberation.

74-2792. MacGregor, J. S. (Southwest Fish. Cent., Nat. Marine Fish. Serv, La Jolla, CA 92037). **Changes in the amount and proportions of DDT and its metabolites, DDE and DDD, in the marine environment off southern California, 1949-72.** *Fish. Bull. 72(2): 275-293; 1974.* (25 references)

Surveys conducted between 1949 and 1972 indicated that the total DDT levels in the ocean off southern California increased. The major apparent source of the insecticide contaminant was waste discharged into the Los Angeles County sewage system by a major manufacturer of DDT. Measurements made in the myctophid fish, *Stenobrachius leucopsarus*, showed that DDT and TDE increased for several years until metabolism, excretion, and dispersion equaled input, at which point the content of these insecticides stabilized in the fish. More persistent, less easily metabolized derivatives of DDT continued to increase in *S. leuco-*

psarus throughout the time period under study. The amount of these persistent derivatives decreased with increasing distance from the sewer outfall. During the earlier years of the surveys, DDT was present in much higher concentrations than TDE or DDT derivatives. During the closing years of these surveys, the more persistent metabolites were more apparent than was DDT itself. Following the cessation of waste dumping from the manufacturing plant in 1970, metabolites from DDT became more abundant than DDT in the myctophids and most other fish species tested.

74-2793. Brooker, M. P.; Edwards, R. W. (Dept. Appl. Biol., Univ. Wales Inst. Sci. Technol., Cathays Park, Cardiff, Wales). **Effects of the herbicide paraquat on the ecology of a reservoir. I. Botanical and chemical aspects.** *Freshwater Biol. 3(2): 157-175; 1973.* (51 references)

Paraquat (1.0 mg/l) was applied to a fishing reservoir to control the angiosperms, *Potamogeton pectinatus* and *Myriophyllum spicatum* and the macrophytic alga, *Chara globularis*. After each application paraquat was quickly lost from the water and was largely taken up by the sediments. The maximum of 6% of the initial paraquat dose was recorded in the macrophytes one day after application. The remaining 36% of the total paraquat applied to the reservoir could not be accounted for. After the first paraquat application some changes were apparent in the water chemistry, e.g. alkalinity, consistent with the death of the plants. Eight months after the second application of paraquat (0.6 mg/l), 64% of the total amount applied was found in the mud, 80% of this in the top 3 cm.

74-2794. Leitis, E.; Crosby, D. G.* (Dept. of Environ. Toxicol., Univ. of California, Davis, CA 95616). **Photodecomposition of trifluralin.** *J. Agr. Food Chem. 22(5): 842-848; 1974.* (42 references)

Trifluralin decomposed readily in water or aqueous methanol at sunlight wavelengths to form a multitude of products. In addition to the minor dealkylated intermediates, the principal product under acidic conditions was 2-amino-6-nitro-α,α,α-trifluoro-*p*-toluidine. At alkaline pH, 2-ethyl-7-nitro-5-trifluoromethylbenzimidazole represented about 80% of the photolysis products within 24 hr. Under all conditions, the highly polar 2,3-dihydroxy-2-ethyl-7-nitro-1-propyl-5-trifluoromethylbenzimidazole and 2-ethyl-7-nitro-5-trifluoromethylbenzimidazole 3-oxide were present in significant amounts but were degraded by heat or further irradiation. The photochemical formation of benzimidazolines, benzimidazoles, and benzimidazole *N*-oxides conforms to a general mechanism which should apply to many dinitroaniline herbicides. (Author abstract reprinted by permission of the American Chemical Society)

74-2795. Nakagawa, M.; Crosby, D. G.* (Dept. of Environ. Toxicol., Univ. of California, Davis, CA 95616). **Photodecomposition of nitrofen.** *J. Agr. Food Chem. 22(5): 849-852; 1974.* (9 references)

Photodecomposition of the herbicide nitrofen (2,4-dichlorophenyl *p*-nitrophenyl ether) in aqueous suspensions under sunlight or simulated sunlight was characterized by rapid cleavage of the ether linkage to form 2,4-dichlorophenol and *p*-nitrophenol. Other prominent products included hydroquinone and 4-nitrocatechol, 2,4-dichlorophenyl *p*-aminophenyl ether, 4,4′-bis(2,4-dichlorophenoxy)azobenzene, and an artifact, *N*-[4-(2′,4′-dichlorophenoxy)]phenylformamide. Other pathways involved the replacement of the ring chlorines by hydroxyl or hydrogen, ring hydroxylation, denitration by hydroxide prior to cleavage of the ether linkage, and possible intramolecular rearrangement of the nitrofen to a biphenyl. (Author abstract reprinted by permission of the American Chemical Society)

74-2796. Miller, L. L.; Nordblom, G. D.; Yost, G. A. (Chem. Dept., Colorado State Univ., Fort Collins, CO 80521). **Photochemistry of *N*-(α-trichloromethyl-*p*-methoxybenzyl)-*p*-methoxyaniline.** *J. Agr. Food Chem. 22(5): 853-855; 1974.* (5 references)

N-(α-Trichloromethyl-*p*-methoxybenzyl)-*p*-methoxyaniline was photolyzed in aqueous solution and on glass, silica gel, cellulose, and leaves. The major photolysis product was *N*,2-dianisyl-2-hydroxyacetamide. Anisaldehyde, anisic acid, anisidine, and *N*,2-dianisyl-2-oxoacetamide were also found in certain cases. In wet ether α,α-dichloroacetophenone and anisidine were formed as major products. A comparison with degradation products formed in a model ecosytem is made. (Author abstract reprinted by permission of the American Chemical Society)

74-2797. Kearney, P. C.; Plimmer, J. R.; Williams, V. P.; Klingebiel, U. I.; Isensee, A. R.; Laanio, T. L.; Stolzenberg, G. E.; Zaylskie, R. G. (Agr. Environ. Qual. Inst., Agr. Res. Cent., U. S. Dept. of Agr., Beltsville, MD 20705). **Soil persistence and metabolism of *N*-*sec*-butyl-4-*tert*-butyl-2,6-dinitroaniline.** *J. Agr. Food Chem. 22(5): 856-859; 1974.* (4 references)

The persistence of the herbicide *N*-*sec*-butyl-4-*tert*-butyl-2,6-dinitroaniline (I) in soil was essentially the same as that of its enantiomorphs. Transformation products were isolated from extracts of Chillum silt loam and from culture solutions of a soil fungus, *Paecilomyces* sp. The major product isolated from soil was the dealkylated derivative of I, 4-*tert*-butyl-2,6-dinitroaniline. The major metabolite isolated from the fungal extracts was an oxygenated analog of I (mol wt 311), and was identified as 3-(4-*tert*-butyl-2,6-dinitroanilino)-2-butanol from its NMR spectrum using shift reagents. The *Paecilomyces* sp., however, did not oxidize

I to a dealkylated product. (Author abstract reprinted by permission of the American Chemical Society)

74-2798. Caro, J. H.; Freeman, H. P.; Turner, B. C. (Agr. Environ. Qual. Inst., Agr. Res. Serv., U.S. Dept. of Agr., Beltsville, MD 20705). **Persistence in soil and losses in runoff of soil-incorporated carbaryl in the small watershed.** *J. Agr. Food Chem. 22(5): 860-863; 1974.* (15 references)

Carbaryl (1-naphthyl methylcarbamate) granules were banded into corn seed furrows in a 0.79-ha watershed at a rate of 5.03 kg/ha active ingredient. Persistence in soil was measured by sampling at ten locations in the watershed on seven occasions throughout the crop season. The potential of the treatment for contamination of nontarget areas was assessed by measuring carbaryl residues in postapplication runoff waters and sediments. The disappearance of carbaryl from soil did not conform to a first-order reaction, but 95% had disappeared in 135 days. The pesticide remained stable in the soil for 25 to more than 116 days at different points in the field, then decayed rapidly. These lag periods indicated that carbaryl degradation was primarily microbiological. Of the 4 kg of carbaryl applied to the field, only 5.77 g was lost during the season in runoff water and sediments. Over 90% of this loss occurred in a single rainfall 19 days after application. About 75% of the seasonal loss was contained in water and 25% in sediment. Carbaryl was less persistent and produced smaller losses in runoff than carbofuran applied to the same field 2 years earlier. (Author abstract reprinted by permission of the American Chemical Society)

74-2799. Kavadia, V. S.; Noor, A.; Saxena, R. C. (Dept. Entomol., Univ. Udaipur, Udaipur, India). **Residues and persistence of endosulfan (Thiodan) in the head and leaves of cauliflower.** *J. Food Sci. Technol. (Mysore) 11(2): 63-65; 1974.* (16 references)

Seedlings of cauliflower variety "Snowball" were planted, and a protective spray application of 0.05% endosulfan was given 27 days later. Two doses of endosulfan, one at the recommended 0.05% and the other at 0.1% endosulfan, were sprayed twice, first, 33 days after the protective spray and, second, 25 days after the first application. Residues of endosulfan in the head and leaves of cauliflower were estimated by a spectrophotometric method. In the leaves average deposits of 13.652 and 43.413 ppm were found from the first applications of 0.05% and 0.1%, respectively. The residues dissipated quickly to below the permissible level of 2 ppm in the head when sprayed with the 0.05% dose in 5 days. Slightly more time was required when the 0.1% dose level was used. No residues were found on leaves 30 days after application. The residue dissipated more rapidly from heads than leaves. Thus, for consumer safety, endosulfan at 0.05% reaches below the tolerance level in 5 days on the head and 10 days on the leaves. Care should be taken in feeding leaves to cattle. It is suggested that these not be fed until 15 days after the application of 0.1% endosulfan.

74-2800. Saha, J. G.; Sumner, A. K. (Agr. Canada Res. Station, Univ. Campus, Saskatoon, Saskatchewan, Canada). **The fate of lindane-^{14}C in wheat flour under normal conditions of bread making.** *Can. Inst. Food Sci. Technol. J. 7(2): 101-104; 1974.* (6 references)

The use of lindane for the protection of stored wheat grain against insect pests leads to the contamination of milled flour. The fate of lindane residues in wheat flour during bread making was studied using the ^{14}C-labeled pesticide. The wheat flour was treated with 0.26, 19.4, and 17.81 ppm lindane-^{14}C. Irrespective of the level of treatment, the baked bread retained 75-82% of the originally applied radioactivity. About 94% of these residues were present as lindane, the remaining radioactivity being represented by the following degradation products: γ-PCCH, 1,2,4-trichlorobenzene, and three isomers of tetrachlorobenzene. The residues were identified by gas chromatography. The possible hazards to human health from such residues should be evaluated and a decision made regarding the desirability of using lindane for the control of stored grain insect pests.

74-2801. Watson, J. R.; Posner, A. M.; Quirk, J. P. (Dept. Soil Sci. Plant Nutrition, Inst. Agr., Univ. of Western Australia, Nedlands, W.-A., Australia). **Adsorption of the herbicide 2,4-D on goethite.** *J. Soil. Sci. 24(4): 503-511; 1973.* (23 references)

The adsorption of the herbicide 2,4-D on an iron oxide, goethite, was studied in aqueous suspensions as a function of the solution pH, ionic strength of the medium, and initial 2,4-D concentration. The 2,4-D anion was reversibly adsorbed on positively charged goethite surfaces, maximum adsorption being observed near the pKa of 2,4-D (2.73) and at low ionic strength. Within certain levels of adsorption (5-22 mg 2,4-D adsorbed/gm goethite), the complex became hydrophobic and floated to the liquid surface. This flotation effect disappeared on further adsorption. The adsorbed 2,4-D anions appear to be oriented with their hydrophobic aromatic ends directed towards the solution, the carboxyl groups being weakly bound to positive sites on the oxide surface. At high levels of adsorption, some of the anions are oriented in the opposite direction by π-π interaction with the first adsorbed layer, and the surface reverts to its hydrophilic nature.

74-2802. Lyubenko, P. Kh.; Stefanskiy, K. S.; Rozenfel'd, A. A. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **Reglamenty primeneniya polikhlorkamfena v sel'skom khozyaystve i soderzhaniye yego v pochve i rasteniyakh. [Regulations for polychlorocamphene use**

in agriculture and content of it in soil and plants.] *Khim. Sel. Khoz. 11(12): 908-909; 1973.* (Russian)

A complex study of the persistence and toxicity of polychlorocamphene was performed for hygienic standardization. Slow degradation of polychlorocamphene in moist soil at temperatures below 40°C was observed. The half-life period at 40°C was 45 days during which time there was practically no degradation at 20°C. The degree of degradation, as determined in soil 3 and 12 months after introduction of a dose of 10 mg/kg, was 21% and 50%. Degradation was not observed in water at 20°C during 30 days, while boiling for 6 hr resulted in 98% degradation. High persistence and accumulation of polychlorocamphene were observed in several plants, especially carrots, sugar beets, parsley, and tomatoes in which residue levels of 2.3-26 mg/kg were measured. Most of the residue was concentrated in the skin of the fruits. When present in concentrations over 0.1 mg/kg, polychlorocamphene deteriorated the organoleptic properties of the fruits. Peeling and prolonged boiling are necessary for the effective abatement of the residue contents in fruits and vegetables. Tests performed on mice and rats revealed high acute and chronic toxicity of polychlorocamphene (LD50 45 mg/kg in mice and 240 mg/kg in rats, and cumulation factors of 2.4-3 after prolonged administration of 2.2 and 0.9 mg/kg doses) resulting in lesions of the cerebrum and spinal cord, clonic-tonic spasms, adynamia, structural changes in the parenchymatous organs, as well as changes in the redox enzyme activities even when administered in small doses. On the basis of the investigations, the polychlorocamphene expenditure is recommended to be limited to 1.2-2 kg/ha, and a waiting time of 2.5 months should be maintained. The maximum allowable residue levels in soil as well as in potatoes and sugar beets are set at 0.5 mg/kg and 0.1 mg/kg, respectively.

74-2803. Novozhilov, K. V.; Volkova, V. A.; Rozova, V. N. (All-Union Res. Inst. Plant Protection, USSR). **Dinamika razlozheniya fosfamida v rasteniyakh i pochve. [Dynamics of the degradation of dimethoate in plants and soil.]** *Khim. Sel. Khoz. 12(3): 39-41; 1974.* (8 references) (Russian)

A method for the determination of dimethoate in soil and studies on the residue dynamics of dimethoate in soil and in beets as a function of the mode of application are described. Dimethoate is extracted from the soil samples by means of chloroform, and determination is done on a silufol layer with chloroform and acetone 9:1 ratio in as the solvent system. The sensitivity of the method is 0.2 mg/kg at recovery rates ranging from 80 to 100%. Dimethoate was detected for 40-60 days in the upper 30 cm layer of the soil, and up to 80% of the total residue content was concentrated in the upper 5 cm layer. The dimethoate residues were lowest in both beets and soil samples when the pesticide was applied between the rows after emergence of the shoots. The rate of degradation in the soil increased with the soil moisture content from 5% to 29%.

74-2804. Yurovskaya, Ye. M.; Zhulinskaya, V. A. (Kiev Sci. Res. Inst. General and Communal Hyg., Kiev, USSR). **Povedeniye fosfororganicheskikh insektitsidov v pochve. [The behavior of organophosphorus insecticides in the soil.]** *Khim. Sel. Khoz. 12(5): 38-41; 1974.* (11 references) (Russian)

Studies were done on the dynamics of the metabolism and effects on soil microorganisms of trichlorfon, metaphos, and carbophos. With initial trichlorfon, metaphos, and carbophos concentrations of 13 mg/kg, 2.68 mg/kg, and 1.75 mg/kg, respectively, residues were completely eliminated from the soil in 40 days, 90 days, and 30 days. When the initial concentrations were 123 mg/kg for trichlorfon, 151.8 for metaphos, and 185.7 mg/kg for carbophos, complete elimination took 50 days, 180 days, and 50 days, respectively. The time required for complete elimination was largely the same in both sterilized and non-sterilized soil. All three insecticides more or less stimulated the bacteria, but did not cause any significant changes in the actinomycete and fungal populations, which indicates that the latter do not participate in their metabolism in chernozem.

74-2805. Ivanova, L. N.; Molozhanova, Ye. G. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **O kinetike prevrashcheniya nekotorykh pestitsidov v pochve. [On the transformation kinetics of certain pesticides in the soil.]** *Khim. Sel. Khoz. 12(5): 43-45; 1974.* (12 references) (Russian)

The dynamics of the elimination of phosalone, carbaryl, and trichlorfon residues in different soils, and factors influencing this process were studied under field and experimental conditions. Phosalone was almost completely eliminated from the soil in 20 days when the original concentration ranged from 2-10 mg/kg. When trichlorfon was present in an initial concentration of 10 mg/kg, elimination was very rapid during the first few days after application and slowed later. Only small traces of trichlorfon were detected after 30 days. The rate of elimination was highest in soils with plants and lowest in soils without vegetation. The rate of elimination of carbaryl, rather low in 45 days, was highest in grey woodland soil and lowest in peaty soil. The reduction of the carbaryl level in the soil was partly due to transfer of this pesticide to potatoes grown in the soil.

74-2806. Tolle, A.; Heeschen, W.; Bluethgen, A.; Hamann, J.; Reichmuth, J. (Inst. fuer Hyg., Bundesanstalt fuer Milchforschung, Kiel, Germany). **Rueckstaende von Bioziden und Umweltchemikalien in der Milch. Eine Untersuchung ueber Nachweis, Vorkommen und Lebensmittelhygienische Bedeutung. [Residues of biocides and environmental chemicals in milk. An investigation into detection, incidence and food hygienic importance.]** *Kiel. Milchwirt. Forschungsber. 25(4): 369-546; 1973.* (German)

The present knowledge of residues of pesticides, drugs, disinfectants, and environmental pollutants in milk and milk products is surveyed. Among the pesticides used in agriculture, particular importance is attached to organochlorine pesticides which, due to their lipophilic properties, are released with the milk. Analyses of 4,036 milk and milk product samples collected from different parts of West Germany revealed that the actual residue levels in such products are far below the maximum allowable concentrations and that these residue levels show an overall decreasing tendency. Organochlorine pesticide residue levels were about 5 times higher in human milk than in cow's milk. The organochlorine pesticide residues have definitely decreased over the past years. Organophosphorus pesticides and carbamates did not accumulate in the food chain and are of minor interest for food hygiene. The fungicide and herbicide residue levels in milk and milk products are expected to increase considerably in the future, but only lipophilic compounds are expected to be released with milk. High BHC residue levels were found in milk and milk products.

74-2807. Gorelik, L. D.; Kushchinskaya, I. N.; Sazonova, A. G. (All-Union Sci. Res. Inst. Canning and Vegetable-Drying Industry, USSR). **Snizheniye soderzhaniya ftalofosa pri proizvodstve konservov "Pyure iz yablok". [Lowering the phthalophos level during the preparation of canned apple sauce.]** *Konserv. Ovoshchesush. Prom. 7: 21-23; 1973.* (Russian)

Studies were done on the effects of industrial processing operations on the reduction of the phthalophos residue level in apples during production of canned apple sauce as baby food and the effects of deep-freezing on the phthalophos residue dynamics in carrots, cabbage, and beets. In the apple sauce canning technology, blanching, crushing, and sterilization reduced the phthalophos residue level 51%, 28%, and 16-25%, respectively. Deep-freezing even for a prolonged time resulted in neglible reduction of the phthalophos level. Vegetables containing phthalophos in excess of the maximum allowable concentration of 0.25 mg/kg should not be frozen prior to processing.

74-2808. Dexter, R. N.; Pavlou, S. P. (Dept. Oceanography, Univ. Washington, Seattle, WA 98195). **Chlorinated hydrocarbons in sediments from southern Greece.** *Mar. Pollut. Bull. 4(12): 188-190; 1973.* (9 references)

PCB and pesticide residues were measured in surface sediment samples collected throughout the Saronikos Gulf off Greece. The treated extracts from these samples were analyzed for DDT, DDE, DDD (TDE), and PCB residues by electron capture gas chromatography. For both the DDT and PCB distribution gradients, the trends indicated that the observed residues resulted primarily from the diffusive transport of contaminated materials discharged at the Keratsini sewage outfall west of Athens. The residue levels for all DDT homologues and isomers ranged from 7.1 to 1893.0 ppb, while the PCB residues ranged from 1.3 to 689 ppb. A major source of PCBs was probably local input from the highly industrialized eastern Elefsis Gulf. Although the Keratsini area can be considered only moderately contaminated in terms of the maximum concentrations and geographical extent of significant benthic deposits, the oligotrophic nature of the waters together with the relatively low flushing rate may increase the impact of the pollutants on this marine ecosystem.

74-2809. Kroger, M. (Pennsylvania State Univ., Div. Food Sci. Ind., University Park, PA 16802). **Chemical contaminants in milk.** *Milchwissenschaft 28(12): 753-757; 1973.* (24 references)

In the 1960's the introduction of gas chromatography into the area of food analysis led to the discovery that DDT, heptachlor epoxide, and lindane were present in milk. It was mainly the exuberance with which these chemicals had been used that led to the problem of residues in milk. Most of the insecticides were passed into the milk by the cow eating feed containing the residues. This problem has been overcome in recent years. Several metals and other inorganic substances found their way into milk. Mercury-dressed grain or fish meal prepared from rejected or contaminated seafood can expose a cow to undesirable mercury levels. Arsenic, used as a rat poison or insecticide, may accumulate and act as a toxin after continued exposure. The normal average arsenic concentration in milk is now 0.05-0.07 mg/kg. Fumigation with methyl bromide results in bromine traces appearing in the milk, but not to the harmful level. Disinfectants can readily be introduced into milk when utensils and containers are not adequately rinsed or drained.

74-2810. Gajduskova, V. (Vet. Res. Inst., Brno, Czechoslovakia). **Dynamics of organophosphorus pesticide residues in butter during manufacture and storage.** *Milchwissenschaft 29(5): 278-280; 1974.* (3 references)

Malathion, fenitrothion, and dichlorvos were dissolved in ethanol and added in 40 mg amounts to ripe cream containing 43% butterfat. Each cream was churned in triplicate and a balance was made of the butter and of organophosphate residue levels in butter. The percentages of malathion, fenitrothion, and dichlorvos passing from experimentally contaminated cream to the manufactured butter were 64.7-71.0, 62.2-67.0, and 53.2-60.5%, respectively. Thus, the initial concentation of organophosphates in the butter was 20-28 mg/kg butter. To pure butterfat were added the pesticides dissolved in hexane at concentrations of 20-25 mg/kg butterfat. Samples of the butter and butterfat were stored without air and light at 20, 4, or -25°C and examined after 7, 14, 21, and 28 days. The rate of

organophosphate breakdown during storage was generally higher by 5-10% in butter than in butterfat due to water emulsified in the butter. Samples at 20°C showed a higher decrease in organophosphates due to higher ambient temperature. Pesticide residue levels as percent of original in samples of butter and butterfat stored for 21 and 28 days, respectively, were 57.0-67.5 for malathion, 68.2-78.1 for dichlorvos, and 74.2-87.0% for fenitrothion. These results indicate evidence for accumulation of malathion, fenitrothion, and dichlorvos in butterfat and for high stability of their residues in butter during manufacture and storage. This stability is due to the fat phase which does not contain reactants and exerts a protective effect on pesticide residues.

74-2811. Zimmerli, B.; Marek, B. (Eidgenoessisches Gesundheitsamt, Bern, Switzerland). **Modellversuche zur Kontamination von Lebensmitteln mit Pestiziden via Gasphase. [Model study on the contamination of foods with pesticides via the gas phase.]** *Mitt. Geb. Lebensmittelunters. Hyg. 65(1): 55-64; 1974.* (16 references) (German)

The mechanism of the contamination of foods with pesticides in the gas phase was studied in model experiments, using lindane and dieldrin as pesticides, and oil, aluminum foil, cellulose filter, and peptone as sorbent layers. The vapor pressures of lindane and dieldrin were determined at 20°C on the basis of diffusion laws, using oil layer as sorbent over a pesticide layer at the bottom of a convection-free chamber. The initial rate of adsorption by different types of foods from the gaseous phase is most probably determined by such factors as the diffusion coefficient in the gas phase, the concentration in air, the thickness of the convection-free air layer, the solubility of the active agent in the different components of foods, and/or the specific surface. This relationship is characteristic of materials with high specific surface, such as oil-impregnated filter paper and cellulose; in foods with relatively small specific surface in which the active agents have low solubility, the rate of diffusion to the inside plays some role. The maximum adsorption capacity of a food for gaseous active agents is most probably determined by the specific surface and/or the solubility of the active agent in question in the food.

74-2812. Lohs, P.; Luckas, B.; Strege, G.; Wetzel, H. (Abteilung Lebensmittel- und Ernaehrungshygiene, Hygiene-Institut des Bezirkes Rostock, Rostock, DDR). **Zur Persistenz von Thiuram auf gruenem Salat. [Persistence of thiram in lettuce.]** *Nahrung 18(1): 53-57; 1974.* (5 references) (German)

The persistence of TMTD thiram on lettuce was studied after different modes and rates of application. Lettuce was either dusted at an expenditure of 7-10 g Wolfen-Thiuram 85 per m^2 or sprayed at an expenditure of 4-1.6 g Wolfen-Thiuram 85 per m^2 in the form of 0.12% aqueous solution. The TMTD residue was not reduced in any case to the maximum allowable concentration of 3 ppm during the 3-day waiting period, and especially not after dusting. Even rainfalls failed to reduce the TMTD residue to the maximum allowable level. To prevent health hazards due to the ingestion of TMTD-treated lettuce, it is proposed that the plants be sprayed, not dusted, immediately after planting at an expenditure of 1.5 g/m^2 and that a waiting period of 21 days be observed.

74-2813. Tharaldsen, J. (Inst. Indre Med., Norges Veterinaerhogsk., Oslo, Norway). **Forurensning av vann under of etter sproyting med 2,4,5-T mot lovkratt. [Water pollution due to spraying with 2,4,5-T for brush control.]** *Nor. Vet. Tidsskr. 85(5): 277-279; 1973.* (Norwegian)

Water contamination was studied following repeated application of 2,4,5-T from helicopter onto brush along a canal. The 2,4,5-T residue in the water as measured immediately after the first spraying was 0.001 mg/kg, and a maximum concentration of 0.005 mg/kg was measured after the 5th spraying. The 2,4,5-T residue level in the water averaged 0.003 mg/kg, far below the ichthyotoxic limit of 1-6 ppm. Dense herbage covering the water surface prevented considerable contamination.

74-2814. Gardner, W. S.; Redman, K.; Safford, J. (South Dakota State Univ., Brookings, SD 57006). **Sensitive medicinal and poisonous plants monitor ozone and 2,4-D air pollution in South Dakota.** *Proc. S. Dak. Acad. Sci. 51: 268; 1972.*

Ozone injury was observed on leaves of tobacco in July 1970. The injury consisted of small white necrotic spots on mature mid-plant and older leaves and developed periodically till frost. Additional tobacco cultivars with a history of variable response to ozone were planted in 1971. 'Bel-B' was tolerant, with 4 to 6 lower leaves on 5 of 8 plants showing very light injury. 'Bel-C' was sensitive with lower to mid-plant leaves showing 5 to 20% injury. 'Bel-W3' was severely injured with killing of basal leaves and moderate to heavy necrotic spotting on lower to mid-plant leaves. Plant injury was estimated at bloom stage. Tobacco grown under dryland conditions had larger leaves but less total leaf area injury from ozone than the same cultivars grown under optimum soil moisture conditions. Ozone injury was noted on *Vitis labrusca* L., *Nicotiana rustica* L., and *Glycyrrhiza glabra* L. in addition to *Nicotiana tabacum* L. Growth abnormalities resembling 2,4-dichlorophenoxyacetic acid injury were noted on V. *labrusca* and *Gossypium hirsutum* L. Severe apical shoot and leaf deformation occurred on grape in 1970 and 1971. Cotton injury was severe in 1970 but light in 1971.

74-2815. Florence, J. C.; Monseigny, A.; Zwobada, F. (Lab. de Recherches, Societe Lesieur Cotelle et Associes,

France). **Teneur en pesticides organochlores des produits et sous-produits d'huilerie. [Organochlorine pesticide contents in oil-work products and byproducts.]** *Rev. Fr. Corps Gras 21(6): 359-362; 1974.* (9 references) (French)

Grains, oil, and oil cake of colza, peanut, corn, soya, and sunflower were analyzed for DDT and BHC residues by gas chromatography with electron capture detector, using petroleum ether for extraction. Immediately after pressing, oil cake contained no detectable amounts of DDT and BHC, but became recontaminated from external sources during storage and handling. A linear relationship between the fat content and the BHC residue level in oil and oil cake was established. The BHC contents in raw oil of sunflower and peanut were less than 0.01 ppm, 0.05-0.2 ppm in colza oil, and 0.06-0.1 ppm in corn and soya oil. The DDT levels were below 0.01 ppm in all raw oil. No more pesticide residues were detected in refined oil, which indicates the high efficiency especially of deodorization in the elimination of the organochlorine pesticide residues.

74-2816. Maki, S. (Author address not given). **[Pesticides and toxicity.]** *Ringyo To Yakuzai (Forest. Forest Chem.) 43: 14-16; 1973.* (Japanese)

Experiments were conducted on soil residues of sodium chlorate and their effects on crops. Sodium chlorate was used both in solution and powder forms and sprayed on 1/5000 are pots in greenhouses in June and July when weeds proliferate. The solution was sprayed at the rate of 1 kg per are and 700 g per are, powder was sprayed at 1.2 kg per are. The test crops of wheat and rape seeds were sowed in October and November at the rate of 30 grains per pot. The sprouting and growth conditions were observed and residues in the crops analyzed. Residues were not detected in any sprouts, and there was no growth difference between the test and control specimens in the three weeks that they were observed. Previous tests have shown that herbicides, and sodium chlorate in particular, degrade in three or four months. These experiments confirmed that crops grown 3-4 months after the spray would not be affected by the residues.

74-2817. Vrochinskiy, K. K. (Author address not given). **Izucheniye migratsionnykh svoystv pestitsidov v model'noy vodnoy ekosisteme. [Migratory properties of pesticides in a model water ecosystem.]** *Ryb. Khoz. 11: 29-31; 1973.* (Russian)

The stability and migration of 11 different pesticides in model ecosystems (water, water with fish, and water with silt and aquatic plants) were studied in a 30-day experiment. The stability of the pesticides in water without aquatic organisms decreased in the order lindane, DDT, polychlorocamphene (toxaphene), abate, baytex (fenthion), fenuron, trichlorometaphos-3 (ronnel), melprex (dodine), polycarbazine, phosalone, and phthalophos (phosmet). The cumulation factors determined in silt, aquatic plants, and fish were in the respective ranges of 0.4-800, 0.4-3,550, and 0.4-1,870. The cumulation factors were under 50 for phthalophos and over 1,000 for DDT and polychlorocamphene. Adsorption and secondary desorption, i.e., circulation of the pesticides in the water ecosystem rather than self-purification, were observed, especially in the case of the most hazardous pesticides—DDT, polychlorocamphene, melprex, and phosalone.

74-2818. Ruedi, D. (Oberwilerstrasse 131, 4000 Basel, Switzerland). **Das Vorkommen und die Bedeutung der chlorierten Kohlenwasserstoffe beim Fealdhasen, speziell im Zusammenhang mit dem Rueckgang der Hasenpopulation seit 1947 (Hasenproblem). [Occurrence and significance of chlorinated hydrocarbons in field hare and their possible significance for the regression of the hare population since 1947.]** *Schweiz. Arch. Tierheilk. 115(12): 597-613; 1973.* (German)

The possible relationship between the occurrence of organochlorine pesticide residues in field hare and the regression of the hare population in Switzerland, especially in the Canton of Bern, since 1947 is discussed on the basis of autopsy and poisoning test data. Chemical analyses of 160 hare liver samples revealed residues of 0.002-2.8 ppm dieldrin in all samples, 5-32 ppb DDD (TDE) in 5 samples, 2-6 ppb α-BHC in four samples, 2 ppb lindane in 4 samples, and 3-25 ppb heptachlor epoxide in 46 samples, the latter probably the result of illegal use of this pesticide which has always been proscribed in Switzerland. None of the samples contained DDT. The rabbits in whose livers pesticide residues were found showed no pathomorphological alterations, and no relationship between diseases and pesticide residue levels was established. Pregnant rabbits and their offspring poisoned with dieldrin in a dose producing the same dieldrin level in the liver as that found in hare showed no clinical and pathomorphological alterations. The findings indicate that organochlorine pesticides are not responsible for the regression of the field hare population in Switzerland.

74-2819. Fujiwara, K. (Chiba Univ., Chiba, Japan). **[Natural degradation of chemicals.]** *Senryo To Yakuhin (Dyest. Chem.) 18(10): 312-318; 1973.* (Japanese)

The natural degradation of chemicals was investigated in laboratory and model river experiments. In the laboratory tests, chemicals were incubated with various concentrations of activated sludge in a Warburg apparatus, and the oxygen consumption and degradation of the chemicals were measured. Carbaryl, Meobal, Bassa (Osbac), and Cosban reduced oxygen consumption by the sludge cultures; high oxygen consumption was seen with Tsumacide (MTMC). About 3% of the carbaryl present was degraded within 20 hr. Much lower degradation

rates were seen in shake tests with 5-30 ppm of carbaryl. A model river 10 m long, 1 m wide, and 1 m deep was prepared; 20 l of pond water and 10 kg of clarifier sludge were added, and a circulation-aeration system set up. Carbaryl added to this system at the rate of 4 μg/ml was completely degraded in 8 days in both water and sediment. About two thirds of the carbaryl was degraded by the second day. Thus degradation seemed to occur much more rapidly under simulated natural conditions than in the laboratory.

74-2820. Hayashi, M. (Dept. Female and Infant Hyg., Nat. Inst. Pub. Health, Tokyo, Japan). **[Mother's milk and environmental pollution.]** *Shonika Shinryo (J. Pediat. Pract.) 37(9): 1113-1119; 1974.* (33 references) (Japanese)

According to a nationwide survey by the Ministry of Welfare during Nov. 1971-Feb. 1972, BHC, DDT, dieldrin, aldrin, endrin, and heptachlor epoxide were detected in 398 specimens of mother's milk collected in 38 prefectures with respective percentages of 100, 100, 75, 6, 1, and 42. The average and (maximal) concentration of total BHC, total DDT, dieldrin, and heptachlor epoxide were respectively 0.105 (0.88), 0.063 (0.31), 0.0034 (0.028) and 0.0011 (0.016)%. These values were compared to those for the U.S., Canada, and the United Kingdom, the characteristic feature of Japanese mother's milk being the high contamination by β-BHC. BHC is higher in non-farming women than in farming women, the difference being attributed to the high content of BHC in beef and cow's milk. The route was β-BHC in pesticide to rice field to rice straw to cow (feeding) to milk and beef to mother to mother's milk. It is recommended that the intake of beef and fish be limited and that fishes selected contain little fat. Special care in food choice should be taken from the early stage of pregnancy through lactation.

74-2821. Hodges, L. R.; Lear, B. (Dept. Nematol., Univ. Calfornia, Davis, CA 95616). **Persistence and movement of DBCP in three types of soil.** *Soil Sci. 118(2): 127-130; 1974.* (4 references)

Measurement of dibromochloropropane (DBCP) by gas chromatography showed that an injection of DBCP at a depth of 20 cm resulted in higher concentrations and deeper penetration in sandy clay loam and silt loam than when it was applied in water. Application of the same amount to the soil surface in 15 cm water showed DBCP was trapped near the surface in these soils. There it was subsequently lost to the atmosphere by codistillation, and very little was recovered from depths of 28-33 cm. However, when applied in irrigation water to very sandy soil, the chemical penetrated, and moderately high concentrations were maintained up to 16 weeks at all depths sampled. Since the predominant movement of DBCP after application by injection is upward, it is assumed that in most soils injection application is superior as the DBCP is not initially next to the surface. Therefore, in soils containing high percentages of silt and clay, if deep penetration and long persistence are required, application by injection is preferred.

74-2822. Scott, H. D.; Phillips, R. E.; Paetzold, R. F. (Dept. Agron., Univ. of Arkansas, Fayetteville, AR 72701). **Diffusion of herbicides in the adsorbed phase.** *Soil Sci. Soc. Amer. Proc. 38(4): 558-562; 1974.* (15 references)

Equations were presented which describe the diffusion of the soil-adsorbed herbicide phase. Assuming (i) no precipitation and volatilization, (ii) a linear adsorption isotherm, and (iii) no net change in herbicide concentration in the adsorbed phase, the data needed to make such a calculation can be determined experimentally and are as follows: soil bulk density, distribution coefficient, apparent self-diffusion coefficient of the herbicide in soil, self-diffusion coefficient of the herbicide in water and the transmission factor. The results indicated that the magnitude of the diffusion coefficient of metribuzin [4-amino-6-*tert*-butyl-3-(methylthio)-*as*-triazin-5(4H) one] in Dubbs soil depends primarily upon the amount in the adsorbed phase and on the moisture content. The magnitude of the adsorbed phase diffusion coefficients of ^{14}C-metribuzin was less than the apparent self-diffusion coefficients and decreased with decreasing soil water content. Since negative adsorbed phase diffusion coefficients were observed at the lower soil water contents, the data suggested that the amount of metribuzin in the adsorbed phase increased as soil water content decreased. (Author abstract by permission)

74-2823. Mayer, R.; Letey, J.; Farmer, W. J. (Dept. of Soil Sci. and Agr. Engineering, Univ. of California, Riverside, CA 92502). **Models for predicting volatilization of soil-incorporated pesticides.** *Soil Sci. Soc. Amer. Proc. 38(4): 563-568; 1974.* (11 references)

In the absence of appreciable mass transfer due to water movement, diffusion processes in the soil account for the movement of pesticides to the soil surface to replace that lost by volatilization. Published solutions for heat flow equations have been applied to the volatilization of lindane and dieldrin from Gila silt loam for a number of different initial and boundary conditions. Predicted fluxes agreed well with experimental values. Five models have been proposed to describe various environmental conditions found in the field. Models I, II, and III assume pesticide concentration at the soil surface is maintained at zero concentration by air movement. Model IV assumes surface pesticide concentrations greater than zero with air turbulence sufficient to maintain zero pesticide concentration gradient in the air above the soil. Model V assumes a non-moving air layer of various depths above the soil surface so that the pesticide concentration gradient in the air controls the rate of volatilization. (Author abstract by permission)

74-2824. Goguadze, V. D. (Author address not given). **Izucheniye ostatochnoy toksichnosti nekotorykh gerbitsidnykh preparatov v pochve, zelenom liste i plodakh mandarina. [Residual toxicity of some herbicide preparations in the soil, green leaves, and fruit of the mandarin orange tree.]** *Subtrop. Kul't. 5: 139-141; 1973.* (Russian)

The residue dynamics and migration of simazine, atrazine, and monuron in chernozem and in tea leaves and mandarin fruits were studied. Simazine decomposed in several months in soil, tea leaves, and mandarins, but its metabolites appeared seven months after treatment. Monuron migrated rapidly from the soil to the tea leaves where it persisted for a long time. A mixture of 6 kg monuron plus 8 kg atrazine per ha in mandarin orange plantations caused a residue level of 0.02-0.03 mg/kg in the fruits, far below the maximum allowable concentration of 1 mg/kg.

74-2825. Tiews, J. (Inst. fuer Ernaehrungsphysiologie, Tieraerztliche Fakultaet der Universitaet Munich, Munich, Germany). **Zuviel Gift in Fleisch? [Too much poison in meat?]** *Ther. Gegenw. 112: 1413-1418; 1973.* (German)

General food toxicological problems of pesticide and antibiotic residues in meat are discussed. A total of seven compounds were detected in an extensive meat sample material subjected to residue analysis in West Germany. The frequency of residue concentrations exceeding the maximum allowable value was small. Moreover, and what is more important, there is no actual hazard of exceeding the maximum daily intake as determined for pesticides. The daily intakes determined for aldrin, DDT, heptachlor and heptachlor epoxide, dithiocarbamates, lindane, and malathion averaged 17%, 10%, 6%, 5%, 3%, and 2% of the respective permissible daily intakes.

74-2826. Ernst, W. (Inst. fuer Meeresforschung, Bremerhaven, Germany). **Gegenwaertige Situation der Meeresverschmutzung durch Organochlorverbindungen. Prototypen umweltbelastender Stoffe. [Present situation of ocean pollution by organochlorine compounds. Prototypes of environmental pollutants.]** *Umwelt 4(4): 32-34; 1974.* (15 references) (German)

Contamination of marine ecosystems by organochlorine pesticides is currently a problem. Pesticides are transported into oceans by rivers and by the atmosphere. The pesticides, almost insoluble in water, are readily soluble in lipids and present in oceans in concentrations in the order of magnitude of 0.001 ppb. However, they accumulate progressively in the trophic chain, starting from microorganisms through plankton, fish, and ending in birds. Cumulation factors of 50,000-100,000 were determined for fish. The DDT residues in mussels and fish are usually below 0.5 ppm. While these concentrations are harmless for human health, such residues may interfere with essential physiological and enzymatic functions of the marine organisms. DDT, dieldrin, and endrin at 0.1-1.0 ppb reduced the rate of photosynthesis in marine phytoplankton. DDT, aldrin and endrin at 10 ppb retarded development of the shell in oysters. The degradation of pesticides in oceans does not necessarily imply reduction of the toxicity or of the persistence.

74-2827. Rossbach, H. (Author address not given). **Fremdstoffe in Lebensmitteln. Zu wenig Kenntnisse, zu wenig Forschung. [Contaminants in foods. Too little knowledge, too little research.]** *Umwelt 4(Suppl.): 51-56; 1974.* (German)

The degree of food contamination by pesticides, antibiotics, and heavy metals in West Germany is presented and the general lack of data and research emphasized. Organochlorine pesticides like DDT are most often found in foods such as milk and milk products and meat. The DDT residue levels have slightly decreased for the past few years. Levels of plant-protecting agents are expected to rise in fruits and vegetables. Apart from systematic controls of contaminant levels, toxicological studies are required to determine the acute and chronic toxicity and the possible mutagenic and carcinogenic effects of pesticides.

74-2828. Erne, K.; Haartman, U. von (National Veterinary Institute, Stockholm, Sweden). **Fenoxisyrarester i skogsbar och svamp. [Phenoxy herbicide residues in woodland berries and mushrooms.]** *Var Foeda 25(8-9): 146-154; 1973.* (8 references) (Swedish)

The contamination of lingonberries (*Vaccinium vitis-ideae* L.), bilberries (*Vaccinium myrtillus* L.), raspberries (*Rubus idaeus* L.), and mushrooms was studied after phenoxyester formulations (2,4-D, 2,4,5-T) were sprayed from airplane or tractor at expenditures of 1.5, 2, or 5 kg per ha. A combined thin-layer chromatographic and gas-chromatographic method was used for analysis. Two to four days after spraying the average level of total phenoxy acids was 4.4 (0.03-10.2) mg/kg in lingonberries, 3.8 (1.9-5.8) mg/kg in bilberries, 1.5 (1.0-2.1) mg/kg in raspberries, and 4.5 (0.03-8) mg/kg in mushrooms. Samples collected about one month after spraying contained residue levels of 2.9 (1.0-6.9) mg/kg, 2.0 (1.6-2.8) mg/kg, 1.0 (0.5-1.3) mg/kg, and 0.4 (0.3-0.4) mg/kg, respectively, indicating a relatively slow decrease of residue levels in berries. Long-term storage of lingonberries at -18°C often resulted in marked decreases in the residue level. Rinsing was scarcely effective in reducing the phenoxy acid level in lingonberries; a few days after spraying, up to 25% could be removed, decreasing as time lengthened. Up to 40% of the residue in mushrooms was removed by rinsing, regardless of the sampling time. Parboiling alone or combined with rinsing can reduce residue levels in mushrooms over 60%. The preparation of jam from lingonberries led to only

negligible losses of phenoxy acid. Phenoxy acid residues were not detected in samples of commercial lingonberries or lingonberry jam. Only three of 23 samples of woodland berries, homemade jam, and syrup contained phenoxy acid residues. The phenoxy acid residue levels found in Swedish woodland berries are not considered a consumer hazard.

74-2829. Que Hee, S. S.; Sutherland, R. G. (Dept. Chem., Univ. Saskatchewan, Saskatoon, Saskatchewan, Canada S7N OWO). **Volatilization of various esters and salts of 2,4-D.** *Weed Sci. 22(4): 313-318; 1974.* (7 references)

The degreee and rate of volatilization, and the partial vapor pressures of the methyl, n butyl, and n octyl esters of 2,4-D [(2,4-dichlorophenoxy)acetic acid] were determined at ambient temperatures using a kinetic system approximating field-air conditions. The initial surface area/applied mass ratio (Q), as well as temperature and the type of compound, determined the volatility. Only when the Q values were kept constant did the volatility decrease with increasing chain length and decreasing saturated vapor pressure as expected. A mathematical model was constructed. Similar results were obtained for the amine salts which had saturated vapor pressures of ca 10^{-10} mm Hg at 38°C. Vapor drift can be essentially eliminated by use of the amine salts. (Author abstract by permission)

74-2830. Grover, R. (Agr. Can., Box 440, Regina, Saskatchewan S4P 3A2, Canada). **Adsorption and desorption of trifluralin, triallate, and diallate by various adsorbents.** *Weed Sci. 22(4): 405-408; 1974.* (18 references)

The relative adsorption of trifluralin (*α,α,α*-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine), triallate [*S*-(2,3,3-trichloroallyl)-diisopropylthiocarbamate], and diallate [*S*-(2,3-dichloroallyl)diisopropylthiocarbamate] was studied on several adsorptive surfaces. The herbicides were strongly adsorbed, with the following general trend: activated charcoal > peat moss > wheat straw (*Triticum aestivum* L.) ~ cellulose triacetate > cation exchange resin > anion exchange resin > silica gel ~ cellulose powder > kaolinite ~ montmorillonite. Trifluralin and triallate were readily desorbed from montmorillonite by water, with minimal desorption for peat moss, cellulose triacetate, and wheat straw. (Author abstract by permission)

74-2831. Weber, J. B.; Best, J. A.; Witt, W. W. (Dept. of Crop Sci. and Soil Sci., North Carolina State Univ., Raleigh, NC 27607). **Herbicide residues and weed species shifts on modified-soil field plots.** *Weed Sci. 22(5): 427-433; 1974.* (5 references)

A Shubata soil was modified by the addition of organic matter or montmorillonite clay. Three annual applications of fluometuron [1,1-dimethyl-3-(*α,α,α*-trifluro-*m*-tolyl)urea], prometryne [2,4-bis(isopropylamino)-6-(methylthio)-*s*-triazine], and trifluralin (*α,α,α*-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine) were made and soil samples analyzed at the end of the third year. Less than 0.05 ppm prometryne was found in the subsoils. Prometryne present (by chemical analysis) in the surface soils ranged from 2% (of that originally applied) in the soil without additives to 20% in the soils modified with organic matter and clay. Approximately 12% of the prometryne present in the soil modified with organic matter and 32% of that in the soil modified with clay were detectable by bioassay. Trifluralin concentration (by chemical analysis) ranged from 2% in the soil without additives and soil modified with clay to 11% in the soil modified with organic matter. Approximately 100% of the trifluralin in soil without additives and soil modified with clay was detectable by bioassay while only 15% of that present in soil modified with organic matter was biologically detectable. Fluometuron was presented in the soils in amounts ranging from 0.6 to 1.9% of that applied. Prometryne and fluometuron greatly decreased the large crabgrass [*Digitaria sanguinalis* (L.) Scop.] population and increased the population of yellow nutsedge (*Cyperus esculentus* L.) and crowfootgrass [*Dactyloctenium aegyptium* (L.) Richter]. Trifluralin greatly decreased large crabgrass and crowfootgrass populations, but the plots became completely infested with yellow nutsedge. Horseweed [*Conyza canadensis* (L.) Cronq.] became the overall dominant species the first years after the field was taken out of production. Yellow nutsedge, bermudagrass [*Cynodon dactylon* (L.) Pers.], and other grasses were also prevalent. (Author abstract by permission)

74-2832. Washuettl, J. (Aschergasse 56, Vienna, Austria). **Pestizide in Milch und Milchprodukten. [Pesticides in milk and milk products.]** *Wien. Tieraerztl. Monatsschr. 61(2): 44-51; 1974.* (33 references) (German)

Studies on the contamination of milk and milk products by pesticide residues and residue dynamics and metabolism are reviewed. Pesticide residues in milk may be due to the treatment of the animals with pesticides or to the animals' ingestion of pesticide-contaminated fodder. Residues of organochlorine pesticides and their metabolites (DDT, BHC, dieldrin, lindane, *p,p'*-DDT, *p,p'*-DDE, heptachlor epoxide, chlordane and its epoxy derivative) were found most often in milk; toxaphene and endosulfan were found occasionally. Organophosphorus pesticides, such as parathion, demeton, dimethoate, supracid (methidathion), fenchlorfos (ronnel), and trichlorfon, are excreted rapidly, as are carbamates, dalapon, 2,4-D, 2,4,5-T, and triazines. Such pesticides are present in milk in trace concentrations only. Lindane gave a moldy aftertaste to milk, sour cream, and butter; DDT made milk sweetish. Most of the processes applied in dairy technology bring about reduc-

tion and redistribution of the pesticide residues in the milk products. Heptachlor and its epoxide tend to accumulate in skim milk after centrifugation. Dieldrin and lindane are believed to inhibit the metabolic activity of certain microorganisms including some *Streptococcus* species in milk products.

74-2833. Genigeorgis, C. A.; Riemann, H. (Dept. Epidemiol. Preventive Med., Sch. Vet. Med., Univ. California, Davis, CA). **Food safety and food poisoning.** *World Rev. Nutr. Diet. 16: 363-397; 1973.* (114 references)

Available information on food safety and food poisoning is reviewed, with emphasis on some aspects considered important from a worldwide point of view. A variety of chemical agents, including pesticides, are fed intentionally or unintentionally to animals or are applied to crops and may find their way into the tissues and accumulate there. The actions and metabolic pathways of some of these compounds are well understood, but the consequences of extended use of many are not sufficiently known. For example, seeds treated with alkyl mercury fungicides and fed to hogs caused mercury poisoning and a number of deaths among members of a New Mexico family who consumed pork from the hogs. In addition, various chemicals may be incorporated, intentionally or unintentionally, during the processing and storage of foods. The intentional additives include mold inhibitors and bactericides. In most cases, the unintentional food additives, usually pesticides, have been mistaken for normal food ingredients.

74-2834. Nowak, A.; Swarcewicz, M.; Wybieralski, J. (Inst. Soil Science and Land Reclamation, Acad. Agr., Szczecin, Poland). **Wplyw zawartosci wegla organicznego w glebie i temperatury na dynamike zanikania Nogosu 50 EC. [The effect of soil organic carbon content and temperature on the speed of decomposition of Nogos 50 EC.]** *Zesz. Nauk. Akad. Roln. Szczecinie (38): 293-298; 1972.* (4 references) (Polish)

To test the effect of temperature and organic carbon content of soil on the speed of degradation of DDVP (dichlorvos, Vapona), 50 g samples of soil of similar physical consistency, but containing different amounts of organic carbon (0, 1.05, 1.68 and 4.75%), were covered with 31 µl of DDVP (as Nogos 50 EC) and maintained at either 15°C or 40°C for 8 days and tested periodically. Results revealed that the speed of DDVP degradation increases with increasing content of organic carbon in soil and is greater at 40°C than at 15°C. The DDVP content after 7 days was 38-60% of the initial value at 15°. After only 3 days at 40°C the values were as low as those reached after 7 days at 15°C.

74-2835. Koch, R.; Strobel, K. (Inspekt. Hyg. Arbeits- und Lebensbedingungen, Gera, DDR). **Zur Eliminierung chlororganischer Insektizide durch Verfahren der Wasseraufbereitung. [On the elimination of organochlorine insecticides by water-treatment methods.]** *Z. Gesamte Hyg. Ihre Grenzgeb. 20(7): 442-446; 1974.* (15 references) (German)

The efficiency and the optimum conditions of the aluminum sulfate flocculation method in the elimination of *p,p'*-DDT, *p,p'*-DDE, and lindane from water were studied. Aluminum sulfate as a flocculant was added at a rate of 20-200 mg/liter water, while the DDT and DDE as well as lindane inputs were 1-100 µg/liter water. Adequate elimination of *p,p'*-DDT and *p,p'*-DDE was observed when these pesticides were present in concentrations ranging from 10 to 100 µg/liter and in water with high suspended matter content and high organic matter load, defined as chemical oxygen demand. The elimination was not satisfactory when these pesticides were present in concentrations not greater than 1 µg/liter. Due to its water-solubility lindane was eliminated only at a rate of 15-20% by aluminum sulfate flocculation, which implies the risk of passage of this pesticide through the drinking water supply plant.

74-2836. Koch, R.; Strobel, K. (Inspekt. Hyg. Arbeits- und Lebensbedingungen, Gera, DDR). **Zum Verhalten chlororganischer Insektizide im Wasser. [On the behavior of organochlorine insecticides in water.]** *Z. Gesamte Hyg. Ihre Grenzgeb. 20(7): 446-449; 1974.* (17 references) (German)

Studies and experiments concerning the adsorption, desorption, and degradation of organochlorine pesticides in water are described. Organochlorine pesticides, being nonpolar and lipid soluble, are readily adsorbed on both inorganic and organic materials in water. The rate of adsorption is inversely proportional to the water solubility and directly proportional to the organic matter content in water. Organochlorine pesticides may also undergo desorption from the solid particles. Organochlorine pesticides in water are subject to physical, chemical, and biological degradation processes, the latter essentially enzymatic, which result in the formation of polar, water-soluble metabolites. In experiments with *p,p'*-DDT, *p,p'*-DDE, and lindane in water, 88% of the DDT input, 81% of the DDE input, and 86% of the lindane input were present in the water after 16 weeks with no metabolites detected. At that time, 66% of the *p,p'*DDT was present in the filter residues and 22% in the filtrate, while the corresponding figures for *p,p'*-DDE were 53% and 28%. The degree of adsorption was determined to be 81% for *p,p'*-DDT and 71% for *p,p'*-DDE. Only 9% of the lindane input was present in the filter residue, and 76% was found in the filtrate after 16 weeks.

See also 74-2838 74-2846 74-2898 74-2982 74-2992 74-2993 74-2997 74-2998 74-2999

74-2837. Taylor, C. C. (Malibu, CA). **Chemical toxicity and mental disorder.** *Amer. J. Psychiat. 131(5): 609; 1974.* (4 references)

It has been suggested that some cases of hyperkinesis may result from food additives and pesticides. It is recommended that such persons eat diets low in these chemicals, but such diets are hard to obtain. Airborne pesticides are constantly increasing. Schools are repeatedly sprayed with insecticides and herbicides, not infrequently while students are present. Typical symptoms of intoxication with the common organochlorine pesticides include restlessness, irritability, disturbed sleep, visual disturbance, lessened libido, and severe anxiety. Some urine samples from hyperkinesis victims have shown greater than the LD50 levels of one or another pesticide. A file of over 100 cases of pesticide poisoning which caused severe psychiatric reactions has been established, and includes 3 cases of suicide. Of the 3 suicides, 2 were men who became ill and despondent after transferring pesticides and chemicals from trucks. The third, a young farmer, became very ill after spraying 2,4-D and 2,4,5-T, and despaired of ever getting well. It is suggested that in any case of hyperkinesis or other behavior problem, the possibility of chemical intoxication be considered.

74-2838. Nakakita, H. (Entomol. Lab., Nat. Food Res. Inst., Tokyo, Japan). **Toxicity and residue of some grain fumigants.** *Bochu-Kagaku (Sci. Plant Protect.) 38(1): 43-66; 1973.* (93 references) (Japanese)

The acute toxic effects of the fumigants methyl bromide (MB), chloropicrin (CP), and phosphine (PH3), their residues in various foods, and fumigant residue analysis methods are comprehensively reviewed. Fifty-four cases of acute intoxication from MB fumigation, including four deaths, have been reported by the Japan Ministry of Labor as of May 1969. Poisoning symptoms include numbness of the limbs, inability to walk, limb coordination loss, positive Romberg sign, and loss of Achilles tendon reflex. The tolerance for CP (maximum allowable concentration 0.1 ppm) is the strictest for any fumigant in Japan. No clinical reports of acute toxicity have been published, but soil fumigation has resulted in effects on neighboring residents. Breathing difficulties, loss of consciousness, and extremely low blood pressure have been reported. Some cases of acute intoxication by PH3 have been reported outside of Japan, including 26 deaths between 1900 and 1956. The maximum allowable PH3 level in foods in Japan is 0.3 ppm; some cumulative effects are suspected on the basis of animal experiments. MB residues are present in food in the form of inorganic bromide; the quantity remaining after fumigation is related to the protein and fat levels in the food. Methods of fumigant residue analysis are described.

74-2839. Chambon, P.; Geoffray, C.; Vial, J. (Service d'Hygiene Appliquee, Institut Pasteur de Lyon, Lyon, France). **Un cas de pollution de l'eau d'alimentation par le Gusathion pesticide organo-phosphore. [Pollution of water supply by gusathion, an organophosphorus pesticide.]** *Bull. Trav. Soc. Pharm. Lyon 17(2): 57-58; 1973.* (French)

Contamination of a water supply by gusathion, an organophosphorus pesticide, is described. The contamination was caused by accidental reflux of water from a vat containing gusathion suspension into the water supply network. This happened after siphoning resulting from an interruption of the general water supply. Poisonings due to consumption of contaminated water were averted by reporting the accident to the waterworks immediately. The contaminated water was discharged into the sewer system.

74-2840. Kimbrough, R. D. (Environmental Protection Agency, Chamblee, GA). **Toxic effects of the herbicide paraquat.** *Chest 65(Suppl): 65S-67S; 1974.* (11 references)

The herbicide paraquat, which is a member of the bipyridyl family of herbicides, has been responsible for at least 124 deaths and 60 cases of nonfatal poisoning throughout the world. The lethal dose in adults is about 15 ml of a 20% solution. The symptoms of poisoning include burning of the mouth and throat, nausea and vomiting, respiratory distress, and transient effects on the kidneys, liver, heart, and nervous system; death is usually due to a progressive fibrosis and epithelial proliferation in the lungs. Dermal exposure to the paraquat concentrate may result in severe skin irritation, while nosebleeds may result from exposure to the nasal mucosa and severe eye injuries have resulted from ocular exposure. Paraquat is absorbed through the skin of both humans and animals, the differences between the oral and dermal toxicity in rats being small. The threshold limit value for paraquat in the workroom air in the United States is 0.5 mg/M^3. The effects on the lungs include alveolar epithelial vacuolization and degeneration, alveolar edema, widening of the basement membranes, the appearance of red blood cells in the alveoli, infiltration of the lung with inflammatory cells, fibrosis and epithelial proliferation, and accumulation in the alveoli of electron dense material which resembles lamellar bodies and surfactant. Oxygen should not be administered following paraquat poisoning since it probably aggravates the lung lesions. Effective treatment includes the administration of bentonite, fuller's earth, and related materials; forced diuresis may also be of some value.

74-2841. Wizimirska, J. (Dept. Oral Surg., Regional Hospital, Rzeszow, Poland). **Ocena stanu blony sluzowej jamy ustnej u pracownikow zatrudnionych przy produkcji srodkow chwasto-owado i grzybobojczych. [Evaluation of the state of the oral mucosa in workers employed in production of herbicides, insecticides and**

fungicides.] *Czas. Stomatol. 27(3): 241-246; 1974.* (24 references) (Polish)

The oral cavities of 222 workers employed in the production of different pesticides (group A: 101 working with powdered form, group B: 121 working with liquid forms) were examined and the findings compared to those obtained from 150 workers employed in the building industry (group C). The incidence of leukoplakia was significantly greater in group A (46.53%) and group B (27.27%) than in group C (14.67%). The greatest incidence was found among those in the 30-39 year age bracket (63.64% group A, 36.73% group B). Leukoplakia was more common in those exposed 0-5 years (58.62% group A, 29.33% group B) than in those exposed for longer periods of time (up to 20 years), indicating that the mucous membrane is initially more sensitive to these compounds. Smokers had a higher incidence than non-smokers: 59.70% in group A, 32.10% in group B, 16.91% in group C among smokers as compared to 20.59%, 17.50%, and 7.89% respectively among non-smokers. In addition, inflammatory conditions of lips and gums were more common among workers exposed to pesticides. The incidence of taste disturbances was also high (21.7%). It is concluded that exposure to the powdered form of pesticides is more deleterious than exposure to the liquid form.

74-2842. Giebelmann, R.; Peplow, E. (Inst. fuer gerichtliche Medizin und Kriminalistik, Ernst-Moritz-Arndt-Universitaet, Greifswald, DDR). **Zinkkonzentrationen im menschlichen Organismus nach einer Vergiftung mit Zinkhexafluosilikat. [Zinc concentrations in the human body after poisoning with zinc hexafluorosilicate.]** *Deut. Gesundheitsw. 29(29): 1378-1379; 1974.* (22 references) (German)

The zinc concentrations in the gastric contents, blood, kidney, liver, and muscles were determined by atomic absorption spectrometry following suicidal poisoning with zinc hexafluorosilicate. The zinc contents in the gastric content, blood, liver, kidney, and muscles were 22.8, 2.4, 5.3, 5.3, and 5.7, mg/100 g, respectively, against the corresponding normal levels of 1.9, 1.5, 8.0, 4.0, and 5.0 mg/100 g. In cases of oral poisoning with water-soluble zinc salts, gastric content, blood, and possibly muscles should be used as the most adequate analytical materials.

74-2843. Rao, S.; Brown, R. H. (Dept. Pediatrics, Cook County Hosp., Chicago, IL). **Acute yellow phosphorus rat poisoning.** *Ill. Med. J. 145: 128-130; 1974.* (9 references)

The most common source of acute poisoning in young children in the United States, is the accidental ingestion of rodent and roach powders containing a yellow phosphorus. As rats become increasingly resistant to the warfarin derivatives, the yellow phosphorus poisons may be more widely used and intoxications may be more frequently seen. A 13-month-old Black female was admitted to the hospital within one-half hour of ingesting a pesticide containing 3% yellow phosphorus. Examination revealed an afebrile, well-oriented child, responsive to questions, with an obvious garlic odor to her breath. Vital signs were within normal limits and she did not appear to be in any distress, but she refused to eat. Approximately 21 hours after poison ingestion, her condition began to deteriorate rapidly. The respiratory rate increased and fine rales were heard throughout both lung fields. The liver was soft, nontender, and enlarged, and the EKG revealed myocardial injury and intraventricular conduction defect. The BUN was increasing and she had a marked hyperglycemia. In addition, there was a hyponatremia and severe metabolic acidosis. She became fully comatose and had repeated cardiorespiratory arrests beginning 40 hours after ingestion of the pesticide; she was pronounced dead 2 hours later. Treatment should include gastric lavage with cupric sulfate solution or potassium permanganate solution, leaving mineral oil in the stomach following lavage. Administration of intravenous dextrose, vitamin B complex, vitamin K, calcium gluconate, appropriate i.v. fluids, and possibly blood transfusions are also indicated. The mortality rate is about 50%, death being due to shock, hepatic failure, central nervous system damage, or massive hematemesis.

74-2844. Newton, I. (Nature Conservatory, Edinburgh, Scotland). **Changes attributed to pesticides in the nesting success of the sparrowhawk in Britain.** *J. Appl. Ecol. 11(1): 95-102; 1974.* (16 references)

The nesting success of the sparrowhawk in and near arable areas of Britain has declined since 1947 due to increased egg-breakage and the failure of incubated eggs to hatch. Prior to this time, no instances were recorded of young dead-in-shell, and egg breakage itself was extremely rare. The mean brood size of successful nests delcined from 4.0 in 1947, to 3.2 for the period 1947-1956, and to 2.9 for the period 1956-1970. No change was noted in the initial number of eggs in each clutch nor in the overall mortality of the young after hatching. Before the introduction of DDT and BHC in 1947, 100 clutches could be expected to produce 400 young, but in 1956-1970, only 160 young could be expected, a drop of 60%. For birds nesting in areas remote from arable land, no change was noted, though the sample was small for these areas. The changes noted in sparrowhawks nesting in farmed areas were attributed to contamination of the birds with persistent organochlorine pesticides. More specifically, it is suggested that shell thinning and egg breakage occurred throughout the period of DDT usage, but deaths of partly formed embryos occurred only after the cyclodienes came in.

74-2845. Wadia, R. S.; Sadagopan, C.; Amin, R. S.; Sardesai, H. V. (Neurol. Clin., B. J. Med. Coll., Poona,

India). **Neurological manifestations of organophosphorus insecticide poisoning.** *J. Neurol. Neurosurg. Psychiat. 37(7): 841-847; 1974.* (23 references)

Neurological findings are described in 200 consecutive cases of suicidal ingestion of organophosphorus insecticides from Jan. 1971 to Feb. 1973. Six different forms of neurological syndromes were associated with diazinon poisoning; the most common form, miosis, appeared almost universally. Impairment of consciousness occurred in 10% of the cases; fasciculations, 27%; convulsions, 1%; toxic delirium, 50%; and paralysis, 26%. Toxic delirium was attributed to treatment with atropine. There were two types of paralytic signs, those present on admission, which included impaired consciousness and bilateral pyramidal tract signs, and those occurring during atropine treatment, which consisted of proximal limb weakness, areflexia, and cranial nerve palsies. Only the first type responded to atropine. Of the 36 cases with type 2 signs, 15 died of respiratory paralysis after a viable period of artificial respiration; 21 recovered with no residual deficit. The specific neurological deficits observed correlated poorly with the amount of poison ingested. Neither was there any correlation of the individual neurological signs with the serum and RBC levels of cholinesterase enzymes. It is suggested that neurological signs developing after atropine treatment began differ significantly from those described earlier as "delayed neurotoxicity" and may represent an alternative mode of human toxicity with organophosphorus compounds.

74-2846. Atabayev, Sh. T.; Iskandarov, T. I. (Uzbek Sci. Res. Inst. Sanit., Hyg. and Occup. Dis., USSR). **Teoreticheskiye i prakticheskiye aspekty gigiyeny primeneniya pestitsidov v usloviyakh zharkogo klimata. [Theoretical and practical aspects of the hygiene of the use of pesticides in a hot climate.]** *Med. Zh. Uzb. 8: 16-23; 1973.* (Russian)

Studies on the theoretical and practical problems of the use of pesticides under a hot climate are reviewed. Pesticides accumulated more readily in soils with high organic matter content than in those with low organic content and were more easily accessible for plants from the latter type soils. Many pesticides like dimethoate and phthalophos cause persistent reduction in the vitamin C level in lemon and tomato even after the pesticides are no longer detectable. A study of the combined effects of high temperature (35°C) and anthio (formothion), butyphos (DEF), methylmercaptophos, BHC, and lindane in experimental animals revealed acute oral LD50 values of 122, 136, 76, 632, and 305 mg/kg, under normal temperature conditions, against 85, 80, 54, 370, and 215 mg/kg at high temperature. The changes in the electrolyte balance, blood picture, and blood cholinesterase activity were more pronounced under high-temperature conditions than under normal conditions in chronic poisoning tests. Reduced cholinesterase activity, increased sodium and potassium levels, and reduced choline level in the blood were determined in farm workers exposed to pesticides at high temperature. An extensive survey of rural populations in areas with massive use of pesticides revealed changes in the morbidity due to ischemic heart disease, respiratory troubles, malignant neoplasia, stillbirth and abortion, changes in the blood protein composition, and nearly constant presence of antibodies to organophosphorus and organochlorine pesticides in the blood.

74-2847. Sivitskaya, I. I. (Author address not given). **Sostoyaniye organa zreniya u lits, rabotayushchikh s tetrametiltiuramdisul'fidom (TMTD). [State of the organ of vision in persons working in contact with tetramethylthiuramdisulfide (TMTD).]** *Oftalmol. Zh. 28: 286; 1974.* (Russian)

Ophthalmologic changes in 50 workers, 20-58 years of age, having prolonged occupational contact with TMTD (thiram) are described. Some of the test subjects were being treated for astheno-vegetative syndrome and vegetative vascular dystonia. Lachrymation and photophobia were the initial, temporary symptoms of exposure after prolonged interruption of contact with TMTD. Chronic conjunctivitis was seen in 14% of the cases, along with reduced visual acuity, delayed dark adaptation, reduced corneal sensitivity, change in the diameter of the retinal vessels (in 34%), increased pressure in the retinal artery, and increased tonometric pressure.

74-2848. Savina, A. S.; Kiseleva, N. F. (Toxicological Therapy Center, N. V. Sklifosovskiy Sci. Res. Inst. First Aid, Moscow, USSR). **Izmeneniye miokarda pri otravleniyakh barbituratami i fosfororganicheskimi soyedineniyami (kliniko-morfologicheskiye paralleli). [Change in the myocardium in poisonings by barbiturates and organophosphorus compounds (clinical-morphological parallels).]** *Sov. Med. 36: 113-120; 1973.* (18 references) (Russian)

The results of clinical electrocardiographic, microscopic, and histochemical investigations of the myocardium are presented in a comparative study of 16 cases of fatal poisoning with barbiturates and 29 cases of fatal poisoning with organophosphorus pesticides (parathion, trichlorfon and malathion). In barbiturate poisonings, diffuse and diffuse-focal alterations of the myocardium with a progressively increased permeability of the vessels and successively intercurrent, mildly pronounced necrobiotic changes in the contractile myocardium were observed. In poisonings with organophosphorus pesticides, the clinical symptoms were related to the specific cholinesterase inhibitory action of these poisons (sudden cardiac arrest, pathologically increased electrical systole) in addition to the demonstrable diffuse myocardial changes, similar to those observed in barbiturate poisonings. In poisonings by organophosphorus pesticides, extensive necrotic and

necrobiotic foci were found in the contractile myocardium. Histochemical analyses revealed gross disturbances in the redox enzyme systems of the myocardium in both groups, which evidences the involvement of the energy-producing and growth processes in the myocardium.

74-2849. Miklovich, N. (775 Konstanz, Im Neugut 1, Switzerland). **Vergiftungsfaelle mit einem mindertoxischen Phosphatester-Insektizid bei Haustieren. [Poisonings of domestic animals with a low-toxicity organophosphate insecticide.]** *Tieraerztl. Umsch. 29(2): 85-92; 1974.* (31 references) (German)

Three incidents of poisoning in domestic animals, including some fatalities, due to the low-toxicity insecticide coumaphos in Cuba are reported. Lethal poisoning occurred in piglets that were mistakenly fed coumaphos instead of a drug. Muscular tremor, salivation, nausea, emesis, slight pulmonary edema, dilatation of the heart, and hyperemia of the small-intestinal serosa were seen. High concentrations of coumaphos were present in the fodder and in the gastric content. Cattle previously treated with a combination of hexachloroethane and copper sulfate were dipped in a coumaphos solution. These animals later developed salivation, diarrhea, muscular tremor, and spasms, and many of them died. Here, poisoning was due to oral uptake of the dip, and the deaths were due to the combination of oral and percutaneous uptake, and to the reduction of the hepatic and renal detoxifying ability as a result of the hexachloroethane treatment. In a third incident, calves were fatally poisoned by spraying them weekly with 0.1% coumaphos solution instead of using the prescribed 0.05% solution. Centrilobular necrosis and fatty degeneration of the liver, and necrosis in the tubular epithelium of the kidney were observed. The severe poisoning was due to subtoxic doses of coumaphos against the background of permanently reduced cholinesterase activity.

74-2850. Verhagen, A. R. H. B. (Med. Res. Cent., Univ. Nairobi, Kenya). **Contact dermatitis in Kenya.** *Trans. St. John's Hosp. Dermatol. Soc. 60(1): 86-90; 1974.* (19 references)

It is often said that contact dermatitis is a minor problem in tropical developing countries in contrast to Western countries. Using the most common sensitizers in Western society plus other local or universal potential allergens available, patch tests were performed on patients in a Nairobi, Kenya, skin clinic. Patients with contact dermatitis represented seven percent of new adult cases. There were 11 positive reactions to tetramethylthiuram disulfide (thiram), 3 each to copper sulfate and pyrethrum, and 2 to mercury. Ortho-Difolatan (captafol), a fungicidal spray for coffee trees, produces severe dermatitis, conjunctivitis, stomatitis, and painful bronchitis. The authors saw 23 cases of dermatitis due to this agent, and an inquiry brought many more cases. The authors conclude that the apparent difference in frequency of contact dermatitis between industrial and developing countries is largely due to inadequate detection in the latter.

74-2851. Douglas, J. F.; McGeown, M. G.; McEvoy, J. (Belfast City Hosp., Belfast, Ireland). **The treatment of paraquat poisoning: three cases of recovery.** *Ulster Med. J. 42: 209-212; 1973.* (10 references)

Paraquat and diquat, used in agriculture as surface-contact herbicides, have well known poisoning effects. Although small amounts of "Weedol" (5% paraquat) or paraquat and diquat mixtures are not always fatal, herbicides with higher concentrations (Gramoxone W, 20% paraquat) usually are fatal. Measures are suggested to prevent absorption; increase excretion; maintain the patient; and prevent progressive renal, hepatic, and pulmonary damage in cases where death is not a certainty. These measures include immediate ejection of the swallowed dose followed by washing of the mouth and inducement of vomiting; gastric lavage; instillation of 1-2 liters of 7% suspension of Bentonite which is capable of removing cationic substances from solution by a cation-exchange mechanism; transfer to intensive care unit; encouragement to take oral diet or tube-feeding unless esophageal damage forbids such; establishment of diuresis and daily measure of paraquat excretion; cyclophosphamide (3 mg/kg) and prednisolone (1 mg/kg); peritoneal dialysis or hemodialysis if acute renal failure has developed and if this is the only means of maintaining the patient and excreting the poison; intensive respiratory care for those surviving long enough to require it. Oxygen therapy has been found to be definitely contra-indicated.

74-2852. Baksheyev, N. S. (Author address not given). **Profilaktika patologii ploda i novorozhdennogo (Opyt Ukrainskoy SSR). [Prophylaxis of pathology of the fetus and new-born child (experience of the Ukrainian SSR).]** *Vestn. Akad. Nauk SSSR 28(6): 69-75; 1973.* (Russian)

General problems of prevention in the pathology of the fetus and new-born child to avert prenatal, perinatal, and postnatal deaths are discussed with special regard to the achievements in the Ukrainian SSR. Increased frequency of premature births, underweight babies, toxicoses, and complications of pregnancy were found among women whose milk contained organochlorine pesticides like DDT during lactation.

74-2853. Masiak, M.; Olajossy, M. (Psychiatric Clinic, Med. Acad., Lublin, Poland). **Reakcja depresyjna w nastepstwie zatrucia preparatem fosfoorganicznym Rogor (Bi 58). [Depressive reaction following intoxication with an organophosphorus preparation, Rogor (Bi**

58)]. *Wiad. Lek. 26(20): 1933-1936; 1973.* (9 references) (Polish)

A rare case of depressive reaction in a 16-year-old boy following intoxication with the pesticide Bi 58 which contains the active compound Rogor (38%) is described. The patient was hospitalized with symptoms of poisoning (weakness, nausea, headache) and severe depression after 2 weeks of agricultural work as a hop-picker. During this time he was exposed to Bi 58 through inhalation and direct contact. Abnormal laboratory results 3 weeks after intoxication including bilirubin 3.08 mg%, direct sensitivity reaction ++, indirect reaction ++, cadmium ++, SGOT 85 units, SGPT 60 units (these normalized after 6 weeks). The cholinesterase activity was reduced to 34% after 3 weeks, 50% after 6 weeks, and 60% (lower limit of normal for this age) one month after treatment. Depression (marked pyschomotor retardation, inability to concentrate, suicidal thoughts, guilt feelings, loss of interest, weakness, anxiety, loss of appetite) gradually improved after treatment (insulin sopor, hepason, vitamins) and the patient was released after 38 days of therapy. Recovery coincided with normalization of cholinesterase activity (2½ months after intoxication). Certain aspects of the biochemistry of depression are briefly discussed.

74-2854. Kuebrich, W.; Urban, I. (District Hospital for Pediatric Neuropsychiatry, Nordhausen, DDR). **Endrinvergiftung—ein Beitrag zur Neurophysiologie des epileptischen Anfalls. [Endrin poisoning—neurophysiology of epileptic seizures.]** *Z. Aerztl. Fortbild. 67: 1076-1078; 1973.* (22 references) (German)

A 41-year-old male was acutely poisoned by endrin after inhalation of the vapors in a greenhouse sprayed one day earlier. Asthenia and unconsciousness, followed by clonic-tonic spasms, dextral hemiparesis, orientation difficulties, euphoria, and mixed aphasic disorders were determined. Complete regression of the neurological and epileptic symptoms was achieved in 10 days by symptomatic therapy. A pseudoneurasthenic syndrome and mild, non-specific general changes in the EEG persisted. The epileptic seizure was due to endrin which has its site of attack in the synaptic mechanisms. Endrin causes accumulation of acetylcholine which leads to membrane depolarization ar[illegible] is due to its cholinesterase-inhibiting effect. The neurological and psychic symptoms were secondary effects of the cerebrovascular hypoxic crises as concomitants of grand mal.

74-2855. Croy, I. (Hautklinik, Bereich Medizin, Karl-Marx-Universitaet, Leipzig, DDR). **Ein kasuistischer Beitrag zur Aetiologie der Urtikaria durch Pilzbekaempfungsmittel auf Captan-Basis. [Etiology of urticaria due to captan-based antifungal agents, case report.]** *Z. Gesamte Hyg. Ihre Grenzgeb. 19: 710-711; 1973.* (19 references) (German)

A case of recurrent urticaria in an 18-year-old gardener due to contact with Orthozid 50 (with captan as its active agent) and with plants treated with this preparation is reported. Positive inhalation tests and positive epicutaneous and vascular tests helped identify the causative agent of urticaria as captan. Rapid disappearance of urticaria after interruption of the contact with Orthozid 50 and therapy was noted. No symptoms of poisoning were detected.

74-2856. Levac, L. D.; Blackwood, A. C. (Dept. Microbiol., College McDonald de l'Univ. McGill, Ste.-Anne de Bellevue, Quebec, Canada). **Degradation de l'insecticide Elocron par une bacterie de sol. [Degradation of the insecticide Elocron by a soil bacterium.]** *ACFAS (Ass. Can. Fr. Avan. Sci.) 39: 99; 1972.* (French)

Degradation of the experimental insecticide Elocron (methylcarbamate derivative) by soil microorganisms was studied. A *Pseudomonas* species was able to utilize Elocron as the sole source of carbon; the species utilizes 1,500 ppm Elocron over a period of 7 days at pH 7.5 and at 30°C. The presence of Elocron in the soil caused morphological changes in the *Pseudomonas* species. Elocron is assumed to be metabolized first to salicyl aldehyde, ethyleneglycol, and methylamine by hydrolysis, after which the metabolites are utilized by the microorganisms.

See also 74-2774 74-2785 74-2806 74-2818 74-2826 74-2932

74-2857. Islam, M. F.; Kader, M. B.; Sirois, G. (Dept. de Chimie, Univ. de Moncton, Moncton, New Brunswick, Canada). **Etudes sur les effets physiologiques des derives polyhalogenes. A. Effets du DDT chez les rats. [Studies on the physiological effects of polyhalogenated derivatives. A. Effects of DDT in rats.]** *ACFAS (Ass. Can. Fr. Avan. Sci.) 39: 144; 1972.* (French)

The effect of orally administered and injected DDT was studied on male and female rats. Toxicity of DDT and physiological changes were not observed in rats fed 1,250 ppm DDT for six months. Loss of weight, aggressiveness, change in the fur color, convulsions, and death were observed in another group fed 3,100 ppm DDT. The rate of metabolism and detoxication appeared to be higher in the first case than in the second. Female rats fed 625 mg% DDT in the food and ingesting 1,025 mg DDT gave birth to normal offspring. Some change in blood components was noted.

74-2858. Witschi, H. P. (Dept. de Pharmacologie, Fac. de Medecine, Univ. de Montreal, Montreal, Canada). **Etudes sur la biochimie pathologique du tissue pulmonaire. [Studies on the pathological biochemistry of pulmonary tissue.]** *ACFAS (Ass. Can. Fr. Avan. Sci.) 39: 145; 1972.* (French)

Pathological biochemical reactions of the pulmonary tissue under the action of i.p. injected paraquat were studied in rats. Paraquat caused acute necrosis of the alveolar cells which manifested itself biochemically in the inhibition of the aryl hydrocarbon hydroxylase without affecting the uridine kinase and adenosine triphosphatase activities. The rate of ribonucleic acid synthesis was in the same order of magnitude both in the liver and in the lungs in rats, while in hamsters, the rate of synthesis was twice as high in the liver as in the lungs. Actinomycin D blocked the pulmonary RNA synthesis, while beryllium, nickel carbonyl, and diethylnitrosamine, all three known to be carcinogenic in the respiratory tract, had no acute effect on the synthesis of macromolecules.

74-2859. Grzycki, S.; Czerny, K.; Zarebska, A. (Inst. Hist. Embryol. of the Faculty of Med., Acad. Med. Lublin, Lublin, Poland). **Recherches sur la topographie fonctionnelle des enzymes hydrolitiques dans l'epithelium des tubes contournes du rein. [Studies on the functional topography of the hydrolytic enzymes in the epithelium of the convoluted renal tubules.]** *Acta Histochem. 47: 350-357; 1973.* (24 references) (French)

The functional topography and activity of phosphatases in the cell structural elements of the proximal renal tubuli were studied in male albino rats following administration of 7.5 mg lindane dissolved in 1 ml olive oil through gastric tube daily for one and two weeks. Decrease in the adenosine triphosphatase activity and notable intensification of the acid phosphatase activity were evident after two weeks. The alkaline phosphatase and 5′-nucleotidase activities did not change. The observations are indicative of biophysiological disturbances in the metabolic processes in the epithelial cells of the renal proximal tubuli.

74-2860. Dirlbek, J.; Prazakova, K.; Bendlova, H. (Institute for the Protection of Plants, Praha-Ruzyne, Czechoslovakia). **Toxicke pusobeni nekterych herbicidu na drobne vodni koryse. [Toxic effects of some herbicides on small aquatic crustaceans.]** *Agrochemia (Bratislava) 14(6): 170-172; 1974.* (19 references) (Czech)

The toxicity of 12 herbicides to *Artemia salina* L. was investigated, using the method proposed by Ludemann and Neumann (*Angew. Zool.* 48: 325). Gesaran (metoprotryn) was least toxic, followed by Dicurane, Pyramin (pyrazon), Camparol (prometryne), Dikotex (MCPA), Aresin (monolinuron), Igran (terbutryn), Tribunil (methabenzthiazuron), and Mixi TOK (nitrofen). The toxic concentrations ranged from 5×10^{-3} to 1×10^{-3} per cent. The toxic levels of Tenoran (chloroxuron), Ramrod (propachlor), and Patoran (metobromuron) ranged from 4×10^{-4} to 2×10^{-4} per cent. Herbicides proved less toxic than insecticides; the toxic concentration of organophosphates was on the order of 10^{-7} to 10^{-10} per cent; e.g. with diazinon, the LC50 for *Artemia salina* was 5×10^{-8} per cent.

74-2861. Giri, S. N.; Peoples, S. A.; Llaguno, G. V.; Mull, R. L. (Sch. Vet. Med., Univ. California, Davis, CA 95616). **Oral toxicity of azinphosmethyl in horses.** *Amer. J. Vet. Res. 35(8): 1031-1035; 1974.* (11 references)

A study was conducted to determine the maximal nontoxic concentration of azinphosmethyl when fed in hay to horses. The addition of the insecticide to the daily rations in concentrations of 5, 15, and 25 ppm and feeding for 30, 30, and 7 days, respectively, did not change erythrocytic and plasma cholinesterase values. Feeding a ration containing 50, 75, and 100 ppm for 7 days decreased erythrocytic cholinesterase values (61, 53, and 50% of pretreatment values, respectively) and plasma cholinesterase values (76, 58, and 53%). Decrease of erythrocytic and plasma cholinesterase activities seems directly related to the dose level. No physical signs of toxicosis were observed. It is suggested that the maximal tolerable daily feed concentration of azinphosmethyl for horses is between 25 and 50 ppm. During the posttreatment period of 10 days, the plasma cholinesterase activity values recovered rapidly, reaching pretreatment concentrations. Erythrocytic cholinesterase activity recovered in two stages, a rapid partial recovery and then a slower linear return to normal. This recovery was somewhat slower in horses fed 100 ppm, reaching 83% of normal in 10 days.

74-2862. McDougal, H. D.; Brownson, R. H. (Dept. Human Anat., Univ. California, Davis, CA 95616). **Para-**

thion-induced changes of acetylcholinesterase of the caudate-putamen in the immature rat. *Anat. Rec. 175(2): 378; 1973.*

The esterase inhibiting properties of parathion affect man as well as other mammals. The insecticide specifically inhibits esterases in the central and peripheral nervous systems, including acetylcholinesterase. A single LD50 dose (1/25 mg/kg, i.p.) of parathion in carbowax was administered to 30 day old female albino rats. The colorimetric AChE assay of homogenates demonstrated a rapid fall of activity within one hour, followed by recovery to 60% of controls by 4 hours. This level remained constant until the 24 hour period at which time recovery of AChE activity increased to 85% of control levels within 4 days. Complete recovery required up to 14 days. At the fine structure level the reaction product was membrane bound in the cytoplasm, processes, and synapse of the neuron. The above locations were negative when tissues were treated with eserine sulfate. Animals exposed to parathon exhibited a reduction of reaction product predominantly in the extra-cell space.

74-2863. Mitchell, J. T.; Yntema, C. L. (Dept. Anat., State Univ. New York, Syracuse, NY). **Teratogenic effect of malathion and captan in the embryo of the common snapping turtle, *Chelydra serpentina*.** *Anat. Rec. 175(2): 390; 1973.*

A total of 544 embryos of the common snapping turtle, *Chelydra serpentina* in the pre-limb bud stage of development (25 days) were exposed to either malathion (3 μl) or captan (1 mg) injected into the yolk sac of each egg away from the embryo. The embryos were allowed to develop to stage 20. Embryos exposed to malathion yielded 90% skeletal malformation. Many of these abnormal embryos were underdeveloped, apparently arrested shortly after treatment began. Embryos exposed to captan showed only 18% abnormalities. The abnormalities included both axial and appendicular skeletal deformities. The major anomalies were scoliosis, syndactylism, and aphalangia. Minor aberrations were rib fusions and unequal rib development. In embryos which had not been injected, but rather suspended in water containing 1, 5, or 10 μl of malathion or 1 mg of captan, the effects obtained with the higher concentrations were similar to those resulting from injection of the pesticides. The percentage of malformations in all controls was 3%. Turtle embryos treated at this early stage of limb development were more sensitive to malathion than captan.

74-2864. Gale, T. F.; Ferm, V. H. (Dept. Anat., Dartmouth Med. Sch., Hanover, NH). **Effects of the herbicides 2,4,5-T and pyrazon on embryogenesis in the hamster.** *Anat. Rec. 175(2): 503; 1973.*

2,4,5-T and pyrazon were administered i.v. into pregnant golden hamsters on day 8 of gestation. On day 12 and 14 of gestation normal and abnormal embryos as well as resorption sites were detected. An aqueous solution of 2,4,5-T given to 8 animals at 2 mg/kg caused a 9% resorption rate; controls, 6%. No malformed embryos were detected after external examination. Of the fetuses from 4 hamsters given aqueous pyrazon at 3 to 6 mg/kg, 8% were abnormally small, but the resorption rate was only 5%. Both rib fusions and a malformed tail were observed in 2 litters from hamsters injected with 175 mg/kg of pyrazon in 50% methanol. This treatment caused a 37% resorption rate while 3 controls given 50% methanol produced neither resorptions nor malformations.

74-2865. Munnecke, D. M.; Hsieh, D. P. H. (Dept. of Environ. Toxicol., Univ. of California, Davis, CA 95616). **Microbial decontamination of parathion and *p*-nitrophenol in aqueous media.** *Appl. Microbiol. 28(2): 212-217; 1974.* (15 references)

A mixed microbial culture was adapted to growth on parathion to determine the feasibility of using microorganisms to detoxify concentrated parathion in agricultural wastes. In a 600-ml chemostat, the culture was able to degrade 50 mg of parathion per liter per h. *Para*-nitrophenol, produced by enzymatic hydrolysis of parathion, caused delays in exponential growth which were directly proportional to its concentration. A pseudomonad, isolated from the mixed culture, exhibited optimal growth at 0.21 m*M* *p*-nitrophenol and grew in concentrations up to 3.5 m*M*. In metabolic studies using [^{14}C]*p*-nitrophenol, the nitro group was removed in stoichiometric quantities as nitrite and hydroquinone was tentatively identified as a metabolite. (Author abstract by permission)

74-2866. Simeon, V.; Skrinjaric-Spoljar, M.; Wilhelm, K. (Inst. Med. Res. Occup. Health, Yugoslav Acad. Sci. Arts, Zagreb, Yugoslavia). **Reactivation of phosphorylated cholinesterases in vitro and protecting effects in vivo of some pyridinium and quinolinium oximes.** *Arh. Hig. Rada. Toksikol. 24(1): 11-18; 1973.* (16 references)

Six pyridinium and quinolinium oximes (I-IV) were tested as reactivators of serum and erythrocyte cholinesterases inhibited with medemo and armine. They were also tested for their potential as protective agents in rats poisoned with soman and medemo. Oxime IV (1,3-acetone-bis-(4-pyridinium aldoxime)dichloride) proved to be a good reactivator of erythrocyte cholinesterase inhibited by medemo. Used as a protective agent together with atropine, it increased the LD50 of medemo 48-fold. Oximes I (1-benzyl-4-pyridinium aldoxime chloride) and III (1-phenacyloxime-2-pyridinium aldoxime chloride) were good reactivators of serum cholinesterase inhibited by armine and medemo. Oximes I and III used together with atropine raised the LD50 of medemo 50-fold. Oximes III and II (1-phena-

cyloxime-2-pyridinium aldoxime chloride) used together with atropine increased the LD50 of soman 2-fold (oxime II) and 1.8-fold (oxime III). Oximes V and VI (1-phenacyloxime-quinolinium chloride and 1-phenacyloxime-isoquinolinium chloride) were highly toxic and did not reactivate inhibited cholinesterases to any extent. The effects of the oximes tested were equal to or weaker than those of TMB-4 both in vitro and in vivo.

74-2867. Gordiyenko, V. M.; Kozyritskiy, V. G.; Drozdovich, I. I. (Lab. Morphol. Histochem., Kiev Sci. Res. Inst. Endocrinol. Metabolism, Kiev, USSR). **Reaktsiya gipotalamo-gipofizarnoy sistemy v dinamike razvitiya gipokortitsisma. [Response of the hypothalamo-hypophyseal system in the development of hypocorticism.]** *Arkh. Anat. Gistol. Embriol. 65: 62-68; 1973.* (12 references) (Russian)

The response of the large cell nuclei of the hypothalamus and of the adenohypophysis in the dynamics of the development of *o,p'*-DDD-induced hypocorticism was studied in male dogs fed 25 mg/kg *o,p'*-DDD (TDE) for 3 to 30 days, then killed by electric shock. Increased functional activity of the supraoptical and paraventricular nuclei of the hypothalamus and increased corticotropocyte count in the adenohypophysis were observed after 3 days. Paralleling the development of the hypocorticism, the previously elevated corticotropocyte count began to decrease, and degranulated cells appeared. These seemed to form a transition to the cells found after adrenalectomy. At the level of hypocorticism, corticotropocytes typical of the normal state completely disappeared, and large degranulated cells became prevalent; stellate chromophobic cells with single granules in their cytoplasm also appeared. Obviously, the chromophobes constitute the source for the formation of corticotropocytes. Fluctuating increases were seen in the functional activity in the supraoptical and paraventricular nuclei with concomitant changes in the vasopressor effect of the fluid. The corticotropocyte degranulation process did not correlate with the changes in the supraoptical nucleus and the vasopressor effect of the fluid.

74-2868. Turner, J. C.; Green, R. S. (Wallaceville Animal Res. Cent., Res. Div., Min. of Agr. and Fisheries, Private Bag, Upper Hutt, New Zealand). **Effect of hexachlorobenzene on microsomal enzyme systems.** *Biochem. Pharmacol. 23(17): 2387-2390; 1974.* (15 references)

Male rats were fed for 10 days on a diet containing 333 ppm hexachlorobenzene. Increased microsomal protein levels were noted compared to control rats. On a per g liver basis, the levels of aniline hydroxylase, biphenyl 4-hydroxylase, biphenyl 2-hydroxylase, 4-nitroanisole *O*-demethylase, esterase, cytochrome P-450 and cytochrome b_5 all increased compared with the control values. On a per mg microsomal protein basis, biphenyl 2-hydroxylase, 4-nitroanisole *O*-demethylase and cytochrome P-450 levels increased several-fold compared with the control values. It is suggested that, by inducing the 2-hydroxylation reaction, hexachlorobenzene might cause preferential *ortho*-hydroxylation, as do some carcinogenic polycyclic hydrocarbons, and that in some circumstances this could lead to the formation of carcinogens. (Author abstract by permission)

74-2869. Lech, J. J. (Dept. of Pharmacol., Medical College of Wisconsin, Milwaukee, WI 53233). **Glucuronide formation in rainbow trout—effect of salicylamide on the acute toxicity, conjugation, and excretion of 3-trifluoromethyl-4-nitrophenol.** *Biochem. Pharmacol. 23(17): 2403-2410; 1974.* (19 references)

In rainbow trout, the selective sea lamprey larvicide, 3-trifluoromethyl-4-nitrophenol (TFM), was previously found to be conjugated with glucuronic acid and excreted to a great extent in bile. In order to determine the degree and significance of conjugation of TFM in trout, studies utilizing salicylamide, an inhibitor of glucuronide formation, were carried out. Pre-exposure of rainbow trout to 25 mg/l. of salicylamide decreased the LC50 of TFM from 5.05 to 2.67 mg/l. Coincidental with the increase in toxicity were elevated blood levels of unconjugated TFM and a depression of TFM glucuronide in blood and bile. An increase in the level of unconjugated TFM was also found in brain, muscle and heart from salicylamide-treated trout. Salicylamide increased the half-life of i.p. injected TFM from 1.59 to 4.13 hr and inhibited the glucuronidation of TFM by trout liver extracts in vitro. These studies indicate that glucuronide formation appears to be an important mechanism in the protection of trout from the toxic effects of TFM and possibly other water-borne phenols. (Author abstract by permission)

74-2870. Wood, P. A.; MacRae, I. C. (Dept. Microbiol., Univ. Queensland, Australia). **The effect of several organophosphorus insecticides upon the acetylene-reduction activity of *Azotobacter vinelandii*.** *Bull. Environ. Contam. Toxicol. 12(1): 26-31; 1974.* (5 references)

Acetylene reduction to ethylene is a method widely used to assay nitrogen fixation. This study determines the effects of chlorpyrifos, DOWCO 214 (*O,O*-dimethyl *O*-(3,5,6-trichloro-2-pyridyl)phosphorothioate); DOWCO 217 (3,5,6-trichloro-2-pyridyl dimethyl phosphate); 2-hydroxy-3,5,6-trichloropyridine, the degradation product from the above insecticides; methidathion; diazinon; 2-isopropyl-4-methyl-pyrimidin-6-ol, a degradation product of diazinon; fensulfothion; and phenamiphos on acetylene reduction by *Azotobacter vinelandii*. The bacteria was grown in 50 ml aliquots of mannitol nitrogen-free medium and acetone solutions of the sterilized compounds (5, 100, and 500

μg/ml) were added aseptically to the medium with 0.3% Tween 80 to aid solubility and dispersion. Acetone and Tween 80 did not hinder acetylene reduction at the levels used. No significant effect was detected for chlorpyrifos, DOWCO 214, methidathion, diazinon, phenamiphos, fensulfothion or 2-isopropyl-4-methylpyrimidin-6-ol. 250-500 μg/ml of DOWCO 217 caused significant reduction in ethylene production as did 100-500 μg/ml of 2-hydroxy-3,5,6-trichloropyridine. Pesticides added at log phase of growth gave similar results. However, DOWCO 217 (100 μg/ml) did not inhibit ethylene production and 2-hydroxy-3,5,6-trichloropyridine (50-500 μg/ml) did.

74-2871. Schuphan, I. (Institut fuer Pflanzenschutzmittelforschung, Biologische Bundesanstalt, Berlin, Germany). **Zum Metabolismus von Phenylharnstoffen. III. Metabolismus von Monolinuron-*O*-methyl ^{14}C in *Chlorella pyrenoidosa*. [Metabolism of phenylureas. III. Metabolism of monolinuron-*O*-methyl ^{14}C in *Chlorella pyrenoidosa*.]** *Chemosphere 13(3): 131-134; 1974.* (7 references) (German)

The metabolism of monolinuron-*O*-methyl ^{14}C by *Chlorella pyrenoidosa* was studied with special regard to the demethylation reactions via the less stable *N*-methyl group formed from the *N,O*-dimethyl group of monolinuron. An *N*-demethylation product of monolinuron, *N*-(4-chlorophenyl)-*N'*-methoxyurea, a metabolite with *O*-methyl group, a polar conjugate formed most probably by non-metabolized monolinuron with protein fragments, and a less polar conjugate formed by a glucoside were determined.

74-2872. Kilburn, K. H.; Hudson, A. R.; Halprin, G. M.; McKenzie, W. N.; Merchant, J. A. (Duke Univ. Med. Cent., Durham, NC). **Two patterns for bronchial damage from inhaled materials.** *Chest 65(Suppl): 61S-62S; 1974.* (4 references)

Hamsters and guinea pigs were placed in Plexiglas chambers into which were directed a variety of airborne dusts and aerosols. The pathogenesis of subsequent bronchial impairment was studied in terms of changes in the morphology of the small airway cells and the leukocyte recruitment phenomenon. When administered as an aerosol or adsorbed on silica particles, paraquat damaged the epithelial cells of the airway all the way to the respiratory bronchioles. The damage was greatest to the secretory cells and the ciliated cells, the latter showing occasional extrusion with some mitochondrial vacuolization. The secretory cells showed vacuolization beneath the nuclei, nuclear extrusion, mitochondrial swelling, and marked vacuolization of the endoplasmic reticulum, Golgi vesicles, and Golgi apparatus, as well as cell extrusion. The remaining epithelial cells spread out after others had exfoliated to continue to cover the basal lamina of the airway. These effects mimicked many of the effects of nitrogen dioxide gas on the hamster lung.

74-2873. Shoyama, M.; Miyachi, Y. (Criminology Laboratory, Aichi Prefectural Police Headquarters, Nagoya, Aichi, Japan). **[Studies on metabolism of 3,5-dimethylphenyl *N*-methylcarbamate (Cosban) in rabbit.]** *Eisei Kagaku (J. Hyg. Chem.) 20(4): 213-216; 1974.* (7 references) (Japanese)

The metabolism of an insecticide, 3,5-dimethylphenyl *N*-methylcarbamate (Cosban, Meobal) was examined in rabbits. The purified insecticide was administered p.o. to male rabbits at 70 mg/kg/day for one week, and the urine was collected and extracted daily. From the ether extract of acidified urine, 5-hydroxytoluic acid and (3-carboxy-5-methyl)phenyl *N*-methylcarbamate were isolated by silica gel column chromatography and TLC, and identified. The presence of 3,5-dimethylphenol in the urine was also detected. The mixed solvent (ether and ethanol 2:1) extract of the ether-extracted aqueous layer yielded glucuronides of 5-hydroxytoluic acid and 3,5-dimethylphenol and the sulfate of 3,5-dimethylphenol. The metabolic pathway of the insecticide in rabbits was deduced from the findings. As a trial, 1 mg each of (3-carboxy-5-methyl)-phenyl *N*-methylcarbamate, 5-hydroxytoluic acid, and 3,5-dimethylphenol were added to 100 ml of human urine; after storing the mixture overnight, each component was well separated and detected by silica gel TLC.

74-2874. Villeneuve, D. C.; Panopio, L. G.; Grant, D. L. (Food Res. Lab., Health Protect. Branch, Tunney's Pasture, Ottawa, Ontario, K1A OL2, Canada). **Placental transfer of hexachlorobenzene in the rabbit.** *Environ. Physiol. Biochem. 4(3): 112-115; 1974.* (8 references)

This study demonstrated that hexachlorobenzene (HCB) is transferred across the placenta of rabbits and accumulates in the fetus in a dose dependent manner. HCB (0, 0.1, 1.0, or 10 mg/kg) was administered daily *per os* to White New Zealand rabbits which had been mated on day 0. On day 28 the animals were sacrified, fetuses removed by cesarian section, and various tissues analyzed for HCB. HCB did not affect body weight gain, maternal organ weight, number of fetuses per litter, fetal body and brain weight, or placenta weight. At the lowest level of HCB administration fetal liver weight was decreased. Maternal plasma had the lowest residue level followed by spleen, lung, kidney, heart, brain, liver and fat. Accumulation in all tissues was dose dependent. Fetal liver residue was higher and brain residue was lower than in corresponding maternal tissue. The proportion of HCB in fetal liver expressed as percent of total body burden was 81%, 79.2%, and 69.8% for the 0.1, 1.0, and 10 mg/kg dosage groups, respectively. At the dose levels given HCB did not exhibit any fetotoxicity.

74-2875. Oerberg, J.; Lundberg, C. (Inst. Zoophysiol., Uppsala, Sweden). **Some effects of DDT and PCB on the**

hormonal system in the male mouse. *Environ. Physiol. Biochem. 4(3): 116-120; 1974.* (15 references)

Intact and castrated mature male mice were given daily either 0 or .25 mg DDT or 0 or .25 mg Clophen A 60 (PCB) in 0.1 ml peanut oil for 28 days. Castrated animals were given a daily dose (day 19-28) of testosterone propionate (70 μg in 0.05 ml peanut oil) in order to obtain normal restoration of seminal vesicles. Hepatic cytochrome P-450 contents and liver weights were higher in DDT and PCB-treated animals than in controls. Dry weight of seminal vesicles of castrated DDT- and PCB-treated animals was lower than in castrated controls. No such difference occurred in intact animals. Dry weights of testes in DDT- and PCB-treated animals did not differ from controls.

74-2876. Dieringer, C. S.; Thomas, J. A. (Dept. of Pharmacol., West Virginia Univ. Med. Cent., Morgantown, WV 26506). **Effects of carbaryl on the metabolism of androgens in the prostate and liver of the mouse.** *Environ. Res. 7(3): 381-386; 1974.* (14 references)

Carbaryl (1-naphthyl-*N*-methylcarbamate), a carbamate pesticide, was investigated with regard to its effects on certain metabolic aspects of the male mouse reproductive system. A 5 day period of treatment with carbaryl had little effect on the ability of the anterior prostate gland to biotransform testosterone-1,2-^{3}H to its major nonpolar radiometabolites in vitro. This 5 day treatment period resulted in alterations in hepatic hydroxytestosterone-^{3}H derivatives; carbaryl significantly increased 16α-hydroxytestosterone-^{3}H. The in vitro incubation of carbaryl with prostate tissue and testosterone-1,2-^{3}H resulted in a stimulation of dihydrotestosterone-^{3}H formation, suggesting a direct action of carbaryl on prostatic steroidogenesis. (Author abstract by permission of Academic Press)

74-2877. Van den Bercken, J.; Narahashi, T. (Duke Univ. Med. Cent., Durham, NC 27710). **Effects of aldrin-transdiol—a metabolite of the insecticide dieldrin—on nerve membrane.** *Eur. J. Pharmacol. 27(2): 255-258; 1974.* (9 references)

Experiments were performed on the giant axons of the squid, *Loligo pealei*. The axon was perfused continuously with artificial sea-water at pH 8.0. Aldrin-transdiol and dieldrin were added to the sea-water using ethanol as solvent. The membrane was gradually depolarized by 3 to 13 mV during exposure to 5×10^{-5} *M* aldrin-transdiol for 10 to 30 min. The maximum depolarization observed after 60 min exposure to 10^{-4} *M* aldrin-transdiol was 24 mV. Under voltage clamp conditions the peak transient (sodium) current was suppressed to a much greater extent than the steady-state (potassium) current. The leakage current was increased by aldrin-transdiol. Dieldrin itself at 10^{-4} *M* concentration had no significant effect on squid giant axons. These results indicate that the insecticide dieldrin is first converted to aldrin-transdiol and possibly other metabolites before it can exert its neurotoxic action.

74-2878. Hrdina, P. D.; Peters, D. A. V.; Singhal, R. L. (Dept. Pharmacol., Fac. Med., Univ. Ottawa, Ottawa, Canada). **Role of noradrenaline, 5-hydroxytryptamine and acetylcholine in the hypothermic and convulsive effects of α-chlordane in rats.** *Eur. J. Pharmacol. 26(2): 306-312; 1974.* (25 references)

The effects of α-chlordane, an organochlorine insecticide belonging to the cyclodiene group, on the levels and metabolism of acetylcholine (ACh), noradrenaline (NA), and 5-hydroxytryptamine (5-HT) in discrete areas of the rat brain were studied using male Wistar rats. α-Chlordane (200-300 mg/kg), administered orally, produced slight tremor, hindleg paralysis, convulsive episodes, and a dose-dependent decrease in rectal temperature. Time-course studies of the changes in the brain amines revealed a gradual decrease in cortical and striatal ACh, with a concomitant enhancement of the activity of acetylcholine esterase (AChE). The hypothermic response to the pesticide coincided with a marked decrease in the levels of brain-stem NA and was followed by a rise in the levels of 5-hydroxyindoleacetic acid; 5-HT remained unaltered. Concurrent treatment with α-methyl-*para*-tyrosine but not with 6-fluorotryptophan partially antagonized the hypothermic effect of α-chlordane without influencing the other neurotoxic symptoms. The decrease in brain ACh may be related to the convulsive episodes, while increased release and utilization of NA may be involved in the hypothermic effect of α-chlordane.

74-2879. Vogel, E.; Chandler, J. L. R. (Dept. Radiat. Genetics and Chem. Mutagenesis, Univ. Leiden, The Netherlands). **Mutagenicity testing of cyclamate and some pesticides in *Drosophila melanogaster*.** *Experientia 30(6): 621-623; 1974.* (20 references)

In order to measure possible genetic effects of pesticides, sex-linked lethal tests were performed by feeding studies in adult *Drosophila* males. Test substances were administered in solution or as fine suspensions for three days. MCPA, 4-chloro-2-methylphenoxyacetic acid, may be considered a weak mutagen in *Drosophila*. No noticeable rise of recessive lethal frequencies was observed for 2,4-D, 2,4,5-T, or MCPA, 4-(4-chloro-2-methylphenoxy)butyric acid. However, there may be a very weak effect for MCPB at 4.4 m*M* as well as at 8.8 m*M*. A considerable decline in fertility was produced by 2,4,5-T (7.2 m*M*). Clear mutagenic activity was demonstrated by 1,2-dibromoethane and 1,2-dibromopropane. It is demonstrated that 1,2-dibromoethane can be considered a bifunctional alkylating agent capable of introducing cross-links into biological molecules. Pentachlorophenol and pentachloronitrobenzene were negative in these tests. No evidence for a genetic activity of folpet in *Drosophila* was obtained.

74-2880. Dikshith, T. S. S.; Datta, K. K.; Chandra, P. (Ind. Toxicol. Res. Cent., Lucknow, India). **Interaction of lindane and diazinon on the skin of rats.** *Exp. Pathol. 9(4): 219-224; 1974.* (24 references)

Eighty female albino rats were divided into 4 groups and treated on an area of skin (4 X 4 cm) with 18 mg lindane in 1 ml ethanol (I), 9.1 mg diazinon in 1 ml ethanol (II), lindane and diazinon in ethanol (III), or ethanol alone (IV). Administered doses were one-fifth the dermal LD50 for female rats. The skin was painted daily for 15 days. Animals were sacrificed at intervals of 5, 10, and 15 days after treatment, and skin was examined for cytopathological and histopathological changes. No clinical symptoms of insecticide poisoning were observed in any of the animals; however, 3 animals in group I, one in group II, and 10 in group III died. Skin lesions or dermatitis were not observed in any animals at the end of 15 days. Changes found in skin treated with either insecticide included hyperkeratosis of the epidermal layer, thickening of the stratum corneum, vacuolated cells in the germinal and Malpighian layers, pycnotic nuclei, and swollen endothelial cells. Application of the two insecticides together increased damage to the epidermal layer.

74-2881. Yoshimoto, H.; Kaneko, T.; Horiuchi, S.; Yonemaru, H.; Ikeda, Y. (Author address not given). **[Long-term toxicity of beta-BHC.]** *Nippon Yakurigaku Zasshi (Folia Pharmacol. Jap.) 68(4): 243P; 1972.* (Japanese)

Groups of forty male and female dde mice were given 0, 2, 10, 50, or 250 ppm of β-BHC (β-isomer 99.5%, δ-isomer 0.5%) in the diet for 16 months, then were observed for two more months afterwards. Mice from each group were killed after 2, 3, 12, 16, 17, and 18 months of BHC administration, and blood tests, macroscopic examinations, and histopathological observations were performed. The mortality of the female mice in the 250 ppm group increased greatly within 12 months, and a significant decrease in ALP was noted. A slight increase in total protein was seen in the males. Liver weights increased in both males and females of the 250 ppm groups, and the central liver lobule cells were swollen and altered, especially in males. A significant liver weight increase among the females of the 50 ppm group was the only effect seen in the lower dosage groups. The liver cells of the 250 ppm group returned to normal within two months after discontinuation of BHC administration. The β-BHC level in the fat of groups receiving less than 50 ppm did not increase after three months of feeding at a constant level, and after administration was stopped, the quantities present in tissue declined rapidly. The largest amounts of β-BHC accumulated in adipose tissue, followed by liver, kidney, and brain.

74-2882. Green, M. H. L.; Bridges, B. A.; Gray, W. J. H.; Mottershead, R. P. (M.R.C. Cell Mutation Unit, Univ. Sussex, England). **Comparison of DNA damage caused by dichlorvos and methyl methanesulphonate in polA and polA$^+$ strains of *Escherichia coli*.** *Genetics 74 (2 pt. 2): 100; 1973.*

In a polA strain of *Escherichia coli*, the insecticide dichlorvos and methyl methanesulphonate both caused DNA strand breakage when bacteria were treated in buffer at 37°C for 60 min. Alkaline sucrose sedimentation revealed substantial strand breakage after treatments with 200-500 μg/ml of the two agents. Breaks were not found at these doses in an isogenic polA$^+$ strain, indicating that the breaks could be repaired by DNA polymerase I. However, higher doses of methyl methanesulphonate (2-5 mg/l.) in a polA$^+$ strain did induce strand breaks which could not be repaired in DNA polymerase I. Methyl methanesulphonate thus resembled X irradiation in this respect. Similar doses of dichlorvos did not induce lesions identifiable as strand breaks, but caused an apparently lethal shift of DNA directly from normal to very low molecular weight. Since repair by DNA polymerase I is believed to be accurate, and repair of the remaining strand breaks has been hypothesized to be error-prone, this result may help explain why dichlorvos is less mutagenic than methyl methanesulphonate.

74-2883. Voytenko, G. A.; Medved', I. L. (Kiev Sci. Res. Inst. Ind. Hyg. Occup. Dis., Kiev, USSR). **O vliyanii nekotorykh tiokarbamatov na generativnuyu funktsiyu. [Effect of some thiocarbamates on reproductive function.]** *Gig. Sanit. 38(7): 111-114; 1973.* (6 references) (Russian)

Effects of yalan (molinate), eptam (EPTC), and tillam (pebulate) were studied on reproductive functions of male and female rats. Prolonged administration of 3.6 mg yalan per kg body weight (1/100 LD50) to 7-8-weeks'-old rats for two months caused changes in the functional state of the spermatozoids, in the nucleic acid metabolism, and in the oxidative processes occurring in the gonads. After mating the test animals with intact females, considerable resorption during the subsequent stages of fetal development and increased postnatal lethality were observed. These findings are indicative of a possible genetic effect of yalan. There were no significant differences in the gonadotoxic effect of yalan regarding the reproductive capacity between sexually mature and immature male rats. Eptam and tillam were not gonadotoxic when administered to male rats in doses correponding to 1/100 of LD50 for two months. The 1/100 of LD50 doses of yalan, eptam and tillam caused no changes in the estrocycle and in the reproductive function when administered to female rats under identical conditions.

74-2884. Shumskaya, N. I.; Stasenkova, K. P. (Sci. Res. Inst. Rubber and Latex Products, Moscow, USSR). **Gigiyenicheskiye issledovaniya rezin, prednaznachennykh dlya kontakta s produktami pitaniya.**

[Hygienic studies of resins intended for contact with food products.] *Gig. Sanit. 38(8): 28-30; 1973.* (1 reference) (Russian)

Studies of the long-term toxicity of ingredients and components of rubber and latex products intended for use in contact with foods are described. Tributylthiourea, administered to pregnant rats in doses of 50 and 150 mg/kg (1/20 LD50) during the entire pregnancy, exerted no embryotropic effect. A relationship between the toxic effect and the concentration of thiram and other dithiocarbamates in extracts of rubber products and the duration of the poisoning test was established. The prolonged administration of 0.04-0.05 mg/kg doses of dithiocarbamates caused no alterations, while an increased dose of 0.48 mg/kg for 2 to 4 months caused significant changes in certain parameters.

74-2885. Yefimenko, L. P. (Inst. Rural Hyg., Saratov, USSR). **Materialy k otsenke gonadotropnogo i mutagennogo deystviya gerbitsida butilovogo efira 2,4,5-T. [Materials for assessing the gonadotropic and mutagenic action of the herbicide, 2,4,5-T butyl ester.]** *Gig. Tr. Prof. Zabol. 18(4): 24-27; 1974.* (14 references) (Russian)

The general toxic, gonadotropic, and mutagenic effects of 2,4,5-T butyl ester were studied on male rats in acute and 7-month chronic experiments. Single doses up to 1 mg/kg, introduced into the stomach, had no general toxic effect, and did not interfere with the spermatozoids and the mitotic activity of the bone marrow cells. Unlike the lowest dose of 0.001 mg/kg, 1 mg/kg, 0.1 mg/kg and 0.01 mg/kg doses increased the frequency of cells with chromosomal lesions due to chromatid type aberrations and to increased adhesion of chromosomes. After 2.5 months, 0.1 mg/kg doses increased the number of desquamated canals, reduced the weight and size of the testicles, reduced the spermatogenesis index, and caused the appearance of giant cells in the germinal epithelium. The chromosomal lesions disappeared by the end of the experiment due to adaptive mechanisms. Regarding the cytogenetic effect in single administration, the threshold dose was 0.01 mg/kg, and for both the general toxic and cytogenetic effect a threshold dose of 0.1 mg/kg was found in the chronic experiment. The cytogenetic activity persisted also at the ineffective dose level of 0.01 mg/kg.

74-2886. Takahashi, M.; Osari, R.; Masaki, N.; Inokuchi, K.; Sone, K.; Kasakawa, H.; Umezawa, K.; Kimura, M. (Sch. Pharmacol., Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan). **[Experimental studies on subacute toxicity of methyl *N*-(3,4-dichlorophenyl) carbamate (swep) in mice and rats.]** *Hirosaki Igaku (Hirosaki Med. J.) 26(1): 89-100; 1974.* (4 references) (Japanese)

To examine the subacute p.o. toxicity of methyl *N*-(3,4-dichlorophenyl) carbamate to mice and rats, diet (Oriental powder feed MF) containing 20, 100, 500 or 2000 ppm of the herbicide was given to mice and rats (20 and 15 animals per group respectively) for 3 months. The average daily doses ingested by mice and rats were respectively 3.09, 15.29, 79.29 and 365.71 mg/kg, and 1.63, 8.09, 42.57 and 194.86 mg/kg. Examination revealed depressed weight gain only in mice and rats receiving 2000 ppm. Only at 2000 ppm was a slight decrease in Hb observed in mice and rats. Increased urobilinogen was present in urine of mice given 2000 ppm. No marked change was found on biochemical examination of mice and rats. Only at 2000 ppm was a marked increase in weight of liver and spleen found in mice and rats. A brown pigmentation was noticed in the reticular cells of the spleen of mice and rats, in Kupffer cells of the liver of mice, and in epithelial cells of the kidney tubules of rats. The pigment contained iron and was also found in corresponding cells of controls. However, since the pigmentation paralleled the dose, a correlation between the herbicide and pigmentation can be assumed. No marked change was observed in other organs examined. The maximum no-effect dose of swep for three months oral administration is presumed to be 100 ppm in feed (15.3 mg/kg/day for mice and 8.1 mg/kg/day for rats).

74-2887. Broderson, S. H.; Westrum, L. E.; Sutton, A. E. (Dept. Biol. Structure, Univ. Washington, Seattle, WA). **Studies of the direct coloring thiocholine method for localizing cholinesterase activity.** *Histochemistry 40(1): 13-23; 1974.* (21 references)

Choline ester hydrolysis was studied in vitro using tissues from normal adult cats and albino rats and employing routine and unbuffered variations of the histochemical medium described by Karnovsky and Roots (1964) in their direct coloring thiocholine method for the localization of cholinesterase activity in situ. The substrates, acetylcholine and acetylthiocholine, did not hydrolyze spontaneously in either buffered or unbuffered media. However, the hydrolysis of both choline esters proceeded immediately when exogenous acetylcholinesterase was present in enzyme to substrate ratios of 0.1 or less. All reactions were slower at higher enzyme to substrate ratios. Hydrolysis was prevented by including 2×10^{-4} *M* eserine in the medium, while 2×10^{-4} *M* tetraisopropylpyrophosphoramide (schradan) had no detectable effect. Butyrylthiocholine was not hydrolyzed by exogenous acetylcholinesterase in this system. Homogenates of fresh brains or brains fixed in aldehyde were equally effective in hydrolyzing acetylthiocholine in the unbuffered solution. The results of light and electron microscopic observations confirm other reports that acetylthiocholine in combination with the appropriate inhibitor results in a staining reaction representing the distribution of cholinesterase.

74-2888. Ramsey, J. C.; Rose, J. Q.; Braun, W. H.; Gehring, P. J. (Chemical Biology Res., Dow Chemical,

Midland, MI 48640). **Fate of 6-chloropicolinic acid following oral administration in rats.** *J. Agr. Food Chem. 22(5): 870-873; 1974.* (5 references)

Carboxyl-labeled 6-[^{14}C]chloropicolinic acid (6-[^{14}C]CPA) was administered to three male and three female rats as a single oral dose of approximately 10 mg/kg. Forty-eight hours after administration, 97.64 ± 3.43% of the total dose of ^{14}C activity had been eliminated in the urine, with 1.48 ± 0.47 and 1.30 ± 0.07% eliminated in the feces and air, respectively. Less than 0.3% of the administered ^{14}C remained in liver, kidneys, and skinned carcasses 48 hr following administration. Thin-layer chromatography and mass spectrometry verified that 6-[^{14}C]CPA and its glycine conjugate, *N*-(6-chloropicolinoyl)glycine, accounted for ^{14}C eliminated in the urine during the first 8 hr following administration. The half-life for elimination of 6-[^{14}C]CPA from the body was calculated to be 2.4 hr, and the half-life for clearance of ^{14}C from blood plasma was only 1.1 hr. Thus, it is concluded that following oral administration to rats 6-CPA is partially conjugated with glycine and both the parent compound and its glycine conjugate are rapidly eliminated from the body. (Author abstract reprinted by permission of the American Chemical Society)

74-2889. Clement, J. G.; Hirst, M.; Colhoun, E. H. (Fac. of Med., Dept. of Pharmacol., Univ. of Western Ontario, London, Ontario, Canada). **Comparative toxicity of acetylcholine mustard (methyl-2-acetoxyethyl-2′-chloroethylamine) in the mouse and American cockroach.** *J. Agr. Food Chem. 22(5): 873-876; 1974.* (17 references)

The toxicity of acetylcholine mustard has been investigated in the mouse and the American cockroach. This compound, resembling acetylcholine when dissolved in water, was expected to have high toxicity in the mouse and low toxicity in the insect. In contrast to acetylcholine, high toxicity was obtained in the cockroach with an LD50 approximating that of nicotine (base). Toxicity depended on the route of drug administration and the use of nonaqueous solvents. This procedure maintained the tertiary lipophilic nature of the pure compound and it may be an important factor in allowing the substance to reach a tissue target site. High toxicity was obtained in the mouse; toxicity was related to route of administration of the compound. The aziridinium ion of acetylcholine mustard was more toxic in the mouse than the parent tertiary compound. Symptoms of toxicity and the lack of cholinergic stimulation are discussed for both species of experimental animal. The mechanism of action of acetylcholine mustard in the mouse and insect is unknown. (Author abstract reprinted by permission of the American Chemical Society)

74-2890. Potter, J. C.; Marxmiller, R. L.; Barber, G. F.; Young, R.; Loeffler, J. E.; Burton, W. B.; Dixon, L. D. (Biol. Sci. Res. Cent., Shell Dev. Co., Modesto, CA 95352). **Total ^{14}C residues and dieldrin residues in milk and tissues of cows fed dieldrin-^{14}C.** *J. Agr. Food Chem. 22(5): 889-899; 1974.* (13 references)

Two dieldrin-^{14}C cow feeding trials have been carried out. In the first trial two guernsey cows were fed dieldrin-^{14}C at a level equivalent to 0.11 ppm in their total ration for 3 weeks. The pooled mean residues of ^{14}C and dieldrin determined by a specific glpc method in milk collected at 15, 17, 19 and 21 days were 0.019 ppm equivalents and 0.017 ppm, respectively. In the second trial three guernsey cows were fed dieldrin-^{14}C at a level equivalent to 0.21-0.36 ppm in their ration for 42 days. The pooled mean residues of ^{14}C and dieldrin determined by a specific glpc method in milk collected at 28, 34, 39, and 41 days were 0.036 ppm equivalents and 0.036 ppm, respectively. The mean fat-feed ratios in the mesenteric fat, subcutaneous fat, and butter fat are 1.8, 1.3, and 3.4, respectively. None of the known or hypothetic dieldrin metabolites were detected in the milk or tissues of the cows. (Author abstract reprinted by permission of the American Chemical Society)

74-2891. Wallcave, L.; Bronczyk, S.; Gingell, R. (Eppley Inst. for Res. in Cancer, Univ. of Nebraska Med. Cent., Omaha, NB 68105). **Excreted metabolites of 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane in the mouse and hamster.** *J. Agr. Food Chem. 22(5): 904-908; 1974.* (13 references)

Swiss mice and Syrian golden hamsters were fed 250 μg/g of dietary DDT for up to 4 months and urinary and fecal metabolites were investigated. Both species excreted the base labile glucuronide of bis(*p*-chlorophenyl)acetic acid (DDA) as the principal urinary metabolite. The more stable glycine and alanine conjugates of DDA were also found. The mouse differed from the hamster in excreting DDE in the urine. The excretion of DDE increased during the course of the experiment until in the fourth month it was nearly as prominent as DDA. Endogenously formed cinnamoylglycine was also excreted by the mouse in amounts that increased upon DDT administration. The feces of both species contained DDD(TDE) and DDT. Fecal excretion was not an important route for the elimination of polar DDT metabolites in these animals. (Author abstract reprinted by permission of the American Chemical Society)

74-2892. Reddy, G.; Khan, M. A. Q.* (Dept. of Biol. Sci., Univ. of Illinois at Chicago Circle, Chicago, IL 60680). **In vitro metabolism of ^{14}C photodieldrin by microsomal mixed-function oxidase of mouse, rat, and house flies.** *J. Agr. Food Chem. 22(5): 910-912; 1974.* (28 references)

Metabolism of [^{14}C]photodieldrin, in vitro, was studied with microsomal mixed-function oxidase of rat, mice, and house fly. The results of these experiments indicate that photodieldrin is metabolized at very low

levels in these animals. Qualitative analyses of metabolites showed variation with species and sex of the animal. There were three metabolic products in male and female mice but only two metabolites in male rat and none in the female. However, in female house flies only one metabolite was observed. The microsomal mixed-function oxidase inhibitor piperonyl butoxide blocked the formation of these photodieldrin metabolites. (Author abstract reprinted by permission of the American Chemical Society)

74-2893. Aizawa, K.; Kawamura, A.; Fujiyoshi, N.; Maehashi, H. (Inst. Biol. Control., Fac. Agr., Kyushu Univ., Fukuoka, Japan). **Human feeding test using the bacterial insecticide—*Bacillus moritai* (*Bacillus moritai* Serieś No. 3).** *Nippon Eiseigaku Zasshi (Jap. J. Hyg.) 29(2): 275-280; 1974.* (16 references)

Studies were designed to confirm the non-pathogenicity of *Bacillus moritai* in mammals by examining the effect of ingesting spores on 4 healthy human volunteers, aged 31-48 yr, one of whom served as a control. Each of 3 subjects received 1 gram of living *Bacillus moritai* spores ($.17X10^9$ spores) in a gelatin capsule daily just before breakfast for 5 consecutive days, for a total of $8.5X10^9$ spores. Physical examinations of the volunteers included temperature, blood pressure, pulse rate, respiratory rate, percussion and auscultation of the chest, and palpation of the abdomen. Laboratory tests included routine urinalysis, liver function tests, renal function tests, red and white blood cell counts, hemoglobin concentration, hematocrit value, and plasma protein. These examinations were made immediately before, and 5 and 26-35 days after ingestion. No significant changes in any of the volunteers were noted. Almost all the spores (96%) ingested were excreted in the feces.

74-2894. Poland, A. P.; Glover, E. (Dept. Pharmacol. Toxicol., Univ. Rochester Sch. Med., Rochester, NY 14642). **Genetic expression of aryl hydrocarbon hydroxylase activity. Induction of monooxygenase activities and cytochrome P_1-450 formation by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in mice genetically "nonresponsive" to other aromatic hydrocarbons.** *J. Biol. Chem. 249(17): 5599-5606; 1974.* (18 references)

Administration of 3-methylcholanthrene, β-naphthoflavone, or naphthacene (i.p.) induces monooxygenase activities and the formation of a spectrally distinct CO-binding cytochrome in genetically responsive inbred mice. No such changes occur in genetically nonresponsive inbred mice. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin caused induction of similar magnitudes in either responsive or nonresponsive mice of aryl hydrocarbon (benzo[a]pyrene)hydroxylase activity in liver, bowel, lung, kidney, and skin; 7-ethoxycoumarin-*O*-deethylase activity in liver and kidney; hepatic *p*-nitroanisol *O*-demethylase and 3-methyl-4-methylaminoazobenzene *N*-demethylase activities; and the new formation of cytochrome P_1-450 in liver, bowel, lung, kidney, and skin. Aryl hydrocarbon hydroxylase activity was induced more than 6-fold in the skin and liver by topical application of the dioxin on responsive or nonresponsive mice. Genetically nonresponsive mice have the structural and regulatory genes needed to express these inducible microsomal monooxygenase activities and new formation of cytochrome P_1-450. The defect in these mice must be a failure to recognize less potent aromatic hydrocarbons. It is suggested that a mutation in genetically nonresponsive inbred strains produced a defective receptor with diminished binding affinity for aromatic hydrocarbons.

74-2895. El-Shourbagy, N. A.; Dorough, H. W. (Dept. of Entomol., Univ. of Kentucky, Lexington, KY 40506). **Glycoside conjugative activity in different insect and vertebrate species.** *J. Econ. Entomol. 67(3): 344-346; 1974.* (12 references)

The occurrence and comparative activity of glycoside conjugating enzymes were investigated in insect and vertebrate species. Although some quantitative differences were noted, all species readily conjugated the substrate, 1-naphthol. Glucosyltransferase activity was essentially the same in whole body homogenates and in selected tissues of the adult housefly, *Musca domestica* L., and the American cockroach, *Periplaneta americana* (L.), and larvae of the alfalfa weevil, *Hyper postica* (Gyllenhal), tobacco hornworm, *Manduca sexta* (L.), and Indian meal moth, *Plodia interpunctella* (Huebner). In the rat, the comparable enzyme, glucuronyltransferase, was more active in the liver, kidney, and lungs than in the intestine, stomach, heart, fat, and brain. Glycoside conjugating enzymes were stable when stored in the intact tissue or in various subcellular fractions at -20° and 0°C for 90 days. In vitro glucosylation of 1-naphthol by house flies was not influenced by developmental state, age, sex or insecticide resistance. (Author abstract by permission)

74-2896. Jones, G.; Butler, W. H. (MRC Toxicol. Unit , Med. Res. Council Labs., Carshalton, Surrey, England). **Hepatotoxicity of dioxin (2,3,7,8-tetrachlorodibenzo-1,4-dioxin) for rats.** *J. Pathol. 109(1): 15, 1973.*

Dioxin, a contaminant of the herbicide 2,4,5-trichlorophenoxyacetic acid and the bactericide hexachlorophene, produced immediate depression of food intake and weight loss in rats given oral doses of 50-500 μg/kg. Death occurred in all dosage groups between 3 and 8 weeks. The consistent pathological finding was liver damage. Scattered areas of centrilobular necrosis were found at 2 weeks and associated with progressive thickening of central veins by connective-tissue and mononuclear cells. Multinucleate parenchymal cells, with up to 30 nuclei, developed in association with this lesion. They were characterized by abundant smooth

endoplasmic reticulum, an increase in the number and size of lysosomes, and the presence of membrane-bound vesicles resembling remnants of bile canaliculi. It is suggested that these cells arise from fusion of damaged liver cells. By 10 weeks, the lesion was healing. The progression and repair of the liver damage paralleled the clinical illness in the animals.

74-2897. Jentzsch, R.; Fischer, G. W. (Forschungsstelle fuer chemische Toxikol., Akad. der Wissenschaften der DDR, Leipzig, DDR). **Organische Phosphorverbindungen IV. Kinetische Untersuchungen zum Alkylierungsvermoegen insektizider Phosphorsaeureester. [Organophosphorus compounds IV. Kinetic studies on the alkylating properties of insecticidal phosphate esters.]** *J. Prakt. Chem. 316(2): 249-258; 1974.* (24 references) (German)

The alkylating properties of six organophosphate esters were studied by investigating the reaction kinetics with various different tertiary amines and halides as nucleophilic agents in acetone solvent in a temperature range of 20-100°C to ascertain the possible relationships between their alkylating properties and the mutagenic, teratogenic, and carcinogenic effects of these organophosphorus compounds. The relative reaction rates decreased in the order methyl parathion, dichlorvos, dimethoate, butonate, trichlorfon, and trimethylphosphate. In view of the fact that even trimethylphosphate is able to induce mutagenesis, the more active pesticides investigated must be expected to exert similar effects as well. However, the recently observed carcinogenic and hepatotoxic effects of trichlorfon and dimethoate can not yet be ascribed exclusively to alkylating processes–further research is needed.

74-2898. Molozhanova, Ye, G.; Remizova, L. B.; Brantsevich, L. G. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **Detoksikatsiya khlorofosa pochvennymi mikroorganizmami. [Detoxication of chlorophos by soil microorganisms.]** *Khim. Sel. Khoz. 11(10): 761-762; 1973.* (4 references) (Russian)

The effect of chlorophos (trichlorfon) on soil microorganisms and its metabolism by organisms such as *Sarcina flava, Bacillus mesentericus, B. subtilis, Pseudomonas fluorescens, Penicillium cyclopium, Aspergillus niger, Mucor mucedo, Trichoderma viridis, Debaryomyces klockeri, Zygowilliopsis californicus, Candida tropicalis,* and *C. guilliermondii* were studied. Trichlorfon slightly depressed the growth of all species in concentrations of 0.1-50 μg/ml nutrient solution, but a maximum concentration was required for the depression of ammonifying bacteria. The findings indicate degradation of trichlorfon by these soil microorganisms, especially by the ammonifying bacteria. The latter decomposed trichlorfon completely when added at 0.1-12.5 μg/ml; only 8% of the degradation was due to chemical breakdown. Axenic cultures of *Penicillium cyclopium, Aspergillus niger, Mucor mucedo, Trichoderma viridis,* and *Actinomyces briseus* decomposed 57.1%, 75.6%, 48.3%, 78.5%, and 62.4% of trichlorfon respectively, while cell-free extracts of these microorganisms decomposed 22.3%, 24%, 21.4%, 24.6%, and 22.8%, which is indicative of the predominant decomposition of trichlorfon by the exoenzymes of the microorganisms. The preparation persisted in the soil for up to two weeks.

74-2899. Committee on New Agricultural Chemicals. (Agr. Chem. Inspection Sta., Min. of Agr. and Forestry, Kodaira, Tokyo, Japan). **[The recently registered new agricutural chemicals (Lolop S, Prune, Mitcidin B and Bansoil).]** *Kongetsu No Noyaku (Agr. Chem. Mon.) 18(9): 76-80; 1974.* (Japanese)

The properties of the herbicide Lolop S (5% 2,4-dichlorophenyl 1-pyrrolidinecarboxylate plus 1.5% 2-methylthio-4,6-bis(ethylamino)-*s*-triazine); a plant growth regulator, Prune (25% calcium dodecylbenzenesulfonate); a miticide, Mitcidin B (12% tetranactine and 30% 2-*sec*-butylphenyl *N*-methylcarbamate, Osbac); and a fungicide, Bansoil (40% 5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole) were introduced. The mammalian toxicity of the major ingredient of Lolop S is: LD50 p.o. 2020 and 2200 mg/kg for male rat and mouse; 971 and 1286 mg/kg for male guinea pig and rabbit; LD50 cutaneous 4800 and 7500 for male mouse and rat; TLm (48 hr) 4.0 ppm for young carp. The mammalian toxicity of calcium dodecylbenzenesulfonate is: LD50 p.o. 3680 and 4000 mg/kg, LD50 cutaneous > 20,000 ppm for mouse and rat.

74-2900. Rabloczky, G.; Jancso, T. (Dept. Experimental Toxicology, National Inst. Ind. Health, Budapest, Hungary). **A kolineszteraz-benito phosdrin kisverkori pressor-hatasanak analysise. [Analysis of the pressor effect of the cholinesterase-inhibitor phosdrin on the pulmonary circulation.]** *Kiserl. Orvostud. 25(2): 161-169; 1973.* (13 references) (Hungarian)

The effect of single 10 and 50 μg/kg i.v. doses of phosdrin (a cholinesterase inhibitor) on pulmonary circulation was studied in narcotized cats. The above doses exerted pulmonary pressor effect at dose-dependent intensity without any other cardiovascular effect. The pressor effect on the pulmonary circulation was not influenced by pretreatment with atropine, hexamethone, or antihistamine or by vagotomy. Dihydroergotoxin (Redergam) had partial inhibitory effect, while i.v. administered 3 mg/kg dose of phentolamine (Regitin) strongly inhibited the pressor effect of phosdrin in the pulmonary circulation. The pulmonary pressor effect of phosdrin can be regarded as a direct vascular effect independent of the accumulation of acetylcholine.

74-2901. Buchet, J. P.; Roels, H.; Lauwerys, R. (Unite Toxicol. Ind. Med., Univ. Catholique de Louvain, Brussels, Belgium). **Further characterization of mono and diglyceride lipases in rat tissues.** *Life Sci. 14(2): 371-385; 1974.* (19 references)

The kinetics of inhibition by organophosphate esters were employed in demonstrating that rat heart, intestine, and adipose tissue homogenates contain different enzymes for the hydrolysis of monoolein and for the hydrolysis of diolein into monoolein. Examination of lipase activity inhibition after in vivo adminstration of triamiphos and paraoxon or after incubation with paraoxon and two other non-pesticidal organophosphates in vitro shows that the degrees of mono and diolein lipase inhibition differ, whatever the tissue studied. Organophosphate esters are known to bind covalently to enzyme active sites. The inhibition kinetics indicate the existence of different catalytic sites for monoglyceride and diglyceride hydrolysis in the same tissue homogenate. Additional evidence for the existence in the same tissue of two distinct lipolytic activities for the hydrolysis of mono and diglyceride is given by studying the hydrolysis of a mixture of the two substrates and the effect of monopalmitin on the inhibition by coroxon of diolein hydrolysis. Diolein and monoolein are hydrolyzed to the same extent whether tested individually or in combination, and monopalmitin does not prevent diolein lipase inhibition by coroxon.

74-2902. Groba, J. (Institute of Water Control, Gdansk, Poland). **Badania nad toksycznym wplywem pestycydow z grupy weglowodorow nitrowanych na niektore organizmy wodne. [Studies on the toxic effect of pesticides from the nitrated hydrocarbon group on some water organisms.]** *Mater. Badaw. Inst. Gospod. Wodnej 33(12): 1-33; 1972.* (18 references) (Polish)

To determine the maximum acceptable levels of the dinitrophenol derivatives DNOC, DNPP (isopropyl dinitrophenol), and DNRB (dinitrorhodanobenzene) in surface water, experiments were conducted using as bioindicators the following organisms: *Asellus aquaticus* L., *Salmo gairdnerii*, and *Daphnia pulex* (De Geer). In addition to the pure compounds, the commercial preparations Krezotol (DNOC), Motylkopielik (DNPP), Grzybol (DNRB), and mixtures of these preparations were used. The results were statistically analyzed. The exposure time for *Daphnia* was 96 hours, for fish and *Asellus* 14 days. The rainbow trout was the most sensitive bioindicator and Grzybol the most toxic preparation. No synergistic action was detected when mixtures of different commercial compounds were used. The action of pure DNOC and pure DNPP did not differ substantially from that obtained with the respective commercial preparations, but the effect of pure DNRB was weaker than the effect of the commercial preparation. The maximum tolerated levels of pesticides which after 14-day exposure had no adverse effect on any of the animal species tested were as follows: Krezotol (commercial DNOC preparation) 0.10 mg/l for trout; Motylkopielik (commercial DNPP) 0.56 mg/l for *Asellus*; Grzybol (commercial DNRB) 0.032 mg/l for trout. Using a safety coefficient of 0.1 the following maximum permissible concentrations of these pesticides in surface waters can be assumed: 0.01 mg/l for sodium salt of DNOC, 0.05 mg/l for ammonium salt of DNPP, and 0.003 mg/l for DNRB.

74-2903. Shirasu, Y.; Moriya, M.; Kata, K.; Furuhashi, A.; Kada, T. (Inst. Environ. Toxicol., Tokyo, Japan). **Mutagenicity screening of pesticides in microbial systems.** *Mutat. Res. 26(5): 438; 1974.*

Mutagenicity testing was performed on 165 pesticides, 57 fungicides, 62 herbicides, and 46 insecticides. The Rec-assay system using *Bacillus subtilis* was used in the first step of the screening test. Subsequently reverse mutation experiments, using four strains of Ames' TA strains (histidine auxotrophs) of *Salmonella typhimurium* and two strains (Hcr^+ and Hcr^-) of *Escherichia coli* WP2 strains (tryptophan auxotrophs), were carried out on the Rec-assay positive samples. Mutagenic activities were found for the following four compounds: 2,4-dinitrophenyl thiocyanate, sodium *p*-dimethylaminobenzenediazosulfonate, 5-nitro-1-naphthonitrile, and *N*-(trichloromethylthio) phthalimide. The first 3 chemicals were strong frameshift mutagens.

74-2904. Sutou, S.; Saito, F.; Usuki, K.; Arai, Y.; Tokuyama, F. (Nomura Res. Inst., Kanagawa, Japan). **Quantitative detection systems for chemical mutagens based on gene mutations and chromosomal aberrations.** *Mutat. Res. 26(5): 439-440; 1974.*

To test various chemical compounds different types of mutation and different types of organisms were used as follows: back mutation of *E. coli* b/r wp2 Try^-, back mutation of T4II 1249 (GC in wild type) and T4rII 607 (AT in wild type), T4 phage resistant mutation in *E. coli* B, azetidine carboxylic acid resistance in *S. typhimurium* LT-2, 8-azaguanine resistance mutation in Chinese hamster cells, and chromosomal aberrations in Chinese hamster cells. When the minimal concentrations obtained with different detection systems were compared, the sensitivities to gene mutations and chromosomal aberrations differed. Dichlorvos seemed to have a lower minimal dose with respect to chromosomal aberrations. In studies of chemical mutagenesis the extent to which data obtained in organisms other than man is relevant to man and whether extrapolation from high dosage experiments is appropriate are questioned.

74-2905. Sparrow, A. H.; Schairer, L. A. (Biol. Dept., Brookhaven Natl. Lab., Upton, NY 11973). **Mutagenic response of *Tradescantia* to treatment with X-rays, EMS, DBE, ozone, SO_2, N_2O and several insecticides.** *Mutat. Res. 26(5): 445; 1974.*

The increase in frequency over normal background of pink or colorless mutant cells or groups of cells in petals and/or stamen hairs of mature flowers of various blueflowered *Tradescantia* clones may be used as a monitor or test system for induced genetic injury. The responses of two different clones of *Tradescantia* (clone 02 and 4430) heterozygous for flower color have been studied in preliminary testing of the mutagenicity of four insecticides, dip or spray TEPP, and the systemics Systox, Meta-systox R, and Temik. The pesticides were used at concentrations recommended by the manufacturers. Of these, only TEPP produced a statistically significant increase in the mutation rate. However, satisfactory dose-response data has yet to be obtained, and thus the results can only be viewed as temporary.

74-2906. Patten, B. M.; Oliver, K. L.; Engel, W. K. (Med. Neurol. Br., Nat. Inst. Neurol. Diseases Stroke, Bethesda, MD). **Adverse interaction between steroid hormones and anticholinesterase drugs.** *Neurology 24(5): 442-449; 1974.* (31 references)

Cannulas were placed in the jugular veins of lightly anesthetized male Osborne-Mendel rats. Steroid hormones and anticholinesterase drugs were injected through these cannulas and effects on the single-twitch tension amplitude in the sciatic nerve-anterior tibial muscle preparations of the rats tested. D-tubocurarine (0.08 mg/kg) injected i.v. produced a 30% decrease in the twitch amplitude of the rat anterior tibial muscle. The rat neuromuscular junction is more resistant to d-tubocurarine than is the human myasthenic neuromuscular junction. In general, the results showed a corticosteriod abolition of the anticholinesterase drug-potentiated single-twitch tension amplitude in the nerve-muscle preparation, as well as subsequent refractoriness of steroid-treated animals to the potentiating effects which normally would result from increasing doses of cholinesterase inhibitors.

74-2907. Dybing, O. (Institutt for farmakologi og toksikologi, Norges veterinaerhogskole, Oslo, Norway). **Herbicider i skogbruket -- toksikologiske aspekter. [Herbicides in forestry -- toxicological aspects.]** *Nor. Vet. Tidsskr. 82(12): 701-704; 1971.* (Norwegian)

Studies on the acute and chronic toxicity and the persistence and metabolism of herbicides used in forestry are reviewed. Both 2,4-D and 2,4,5-T, the herbicides most commonly used, are characterized by relatively low acute toxicity, with LD50 values ranging from 300 to 700 mg/kg in most animal species. Sublethal doses of 200 and 100 mg/kg caused anorexia, diarrhea, emesis, muscular weakness, and depression in calves and hogs. Phenoxyacetic acid derivatives are broken down relatively rapidly in both soil and plants, usually within 2-3 weeks; amitrole is broken down in 1-2 days. Unlike 2,4,5-T, 2,4-D is degraded by soil microorganisms rather rapidly. Amitrole and simazine, bound to soil colloids at a rate of up to 90%, are degraded by non-biological processes in soil. The observed teratogenic and mutagenic effect of 2,4,5-T is due to the presence of traces of the highly toxic dioxin. Therefore, the use of 2,4,5-T is limited to places where no edible products are cultivated.

74-2908. Tate, K. R. (Soil Bureau, DSIR, Lower Hutt, New Zealand). **Influence of four pesticide formulations on microbial processes in a New Zealand pasture soil. I. Respiratory activity.** *N. Z. J. Agr. Res. 17(1): 1-7; 1974.* (33 references)

The application of DDT, fensulfothion, fenitrothion, and carbofuran to a yellow-brown earth in Nelson, at the recommended field rates of 2.24 kg a.i. /ha, had no significant effects on the topsoil (0-3 cm deep) respiratory activity over a time period of 30 days. Storage of the pesticide-treated and untreated soil samples at -10°C and the time of sampling with respect to the date of pesticide application had small but significant effects on soil respiratory activity. When the concentrations of the pesticides in the soil were adjusted to 100 ppm (requiring an application rate of about 56 kg a.i./ha) in the laboratory, fenitrothion alone significantly inhibited soil respiratory activity. At 500 ppm (280 kg a.i./ha) all pesticides with the exception of carbofuran significantly inhibited soil respiratory activity. It is noted that measurements of total soil respiration have certain shortcomings, including the failure to detect changes in microbiological species. From these results the respiratory activity of the topsoil of Motupika silt loam does not seem significantly affected by fenitrothion up to 100 ppm, by DDT and fensulfothion between 100 and 500 ppm, or by carbofuran up to 500 ppm.

74-2909. Ross, D. J. (Soil Bureau, DSIR, Lower Hutt, New Zealand). **Influence of four pesticide formulations on microbial processes in a New Zealand pasture soil. II. Nitrogen mineralization.** *N. Z. J. Agr. Res. 17(1): 9-17; 1974.* (26 references)

The influence of pesticides on the nitrogen cycle in soil is important because of the part that nitrogen plays in plant nutrition. The influence of commercial formulations of DDT, fenitrothion, fensulfothion, and carbofuran at a rate of 2.24 kg a.i./ha (about 7.5 ppm) on nitrogen mineralization and nitrification was studied in a pasture soil, Motupiko silt loam, in the Nelson area. DDT, fenitrothion, and fensulfothion had no effect 49 and 139 days after application. Carbofuran may initially have an indirect, slight stimulating effect, possibly due to its lethal action on earthworms. All formulations influenced these processes when added at 100 and 500 ppm active ingredient. Three of the formulations contain calcium carbonate which itself shows marked effects. At 10,000 ppm it stimulated nitrogen mineralization. At 2,000 and 4,500 ppm it initially stimulated, but then

depressed mineralization. After correcting for the calcium carbonate effect, DDT had no influence, but fensulfothion and carbofuran stimulated production of nitrate-N and mineral-N to some extent. Fenitrothion at 500 ppm initially strongly inhibited the oxidation of ammonium-N to nitrate-N. Subsequently, however, it markedly enhanced nitrogen mineralization. It is suggested that care be exercised in the use of fenitrothion. Although it is not persistent in soil, large application may temporarily accumulate NH_4-N in the soil.

74-2910. Fuhremann, T. W.; Lichtenstein, E. P.*; Zahlten, R. N.; Stratman, F. W.; Schnoes, H. K. (Dept. of Entomol., Russell Lab., Univ. of Wisconsin, Madison, WI 53706). **Metabolism of ^{14}C parathion and ^{14}C paraoxon in isolated perfused rat livers.** *Pestic. Sci. 5(1): 31-39; 1974.* (11 references)

Perfusion of ^{14}C-(*ring*)-parathion or ^{14}C-(*ring*)-paraoxon with blood through isolated, intact rat livers resulted in the rapid degradation of these insecticides. Degradation was negligible in the absence of rat liver (controls), thus demonstrating the capacity of the liver per se to effectively degrade these compounds. Of the total radiocarbon recovered after liver perfusion with [^{14}C]parathion, 33% could be attributed to unchanged [^{14}C]parathion (similarly distributed between the liver and the blood) while 67.9% was degraded to water soluble compounds and 2.5% was converted to organic soluble paraoxon and traces of *p*-nitrophenol. Nearly all of the [^{14}C]paraoxon, however, was degraded by the intact rat liver, resulting in water soluble products that amounted to 98.5% of the total radiocarbon recovered. Unexplained losses of radiocarbon with the perfusion apparatus used were lower in the presence of rat liver which degraded the insecticides to more water soluble compounds. The water soluble-degradation products produced from [^{14}C]parathion and [^{14}C]paraoxon were non-toxic to mosquito larvae (*Aedes aegypti* L.). These *ring*-labeled products were found to be conjugated *p*-nitrophenol. Nearly all of the water soluble radiocarbon was located in the perfused blood, while only small amounts (1.8 to 3.0% of recovered) were excreted via the bile or were associated with the liver tissue (1.3 to 1.8% of recovered). (Author abstract by permission)

74-2911. Machin, A. F.; Anderson, P. H.; Herbert, C. N. (Cent. Vet. Lab., Min. of Agr., Fisheries, and Food, New Haw, Weybridge, Surrey, England). **Residue levels and cholinesterase activities in sheep poisoned experimentally with diazinon.** *Pestic. Sci. 5(1): 49-56; 1974.* (23 references)

Sheep were dosed orally with diazinon at 450 and 600 mg/kg; residues of diazinon were determined in the blood, brain, liver, kidney cortex and medulla, muscle, fat, and rumen contents at intervals after dosing, and cholinesterase activities in the erythrocytes and the brain were determined at the same intervals. The relations between residues, cholinesterase activity, and clinical symptoms are discussed from the points of view of their diagnostic value and the possibility of undesirable residues occurring in poisoned animals. Rough estimates of the residues of two metabolites, hydroxydiazinon and dehydrodiazinon, in one sheep are also discussed. The oxygen analogue of diazinon was not detected although it was specifically sought. (Author abstract by permission)

74-2912. Whitehead, C. C.; Downie, J. N.; Phillips, J. A. (Agr. Res. Council's Poultry Res. Cent., Edinburgh EH9 3JS, Scotland). **Some characteristics of the egg shells of quail fed gamma-BHC.** *Pestic. Sci. 5(3): 275-279; 1974.* (17 references)

The effects of feeding a diet containing gamma-BHC at a level of 200 mg/kg on various aspects of egg production and egg shell quality of the Japanese quail were studied. No adverse effects were observed on rate or pattern of egg production, egg size, shell thickness, calcium content, shearing strength or structure as seen through the scanning electron microscope. (Author abstract by permission)

74-2913. Fink, G. B. (Dept. Pharmacol., Oregon State Univ., Corvallis, OR 97331). **Interaction of lead, DDT and dieldrin on motor coordination and neuromuscular function.** *Pharmacologist 16(2): 207; 1974.*

Mice or rats were given a single dose (1/2, 1/4, 1/8 LD50) of lead, DDT, or dieldrin, either alone or in combination. The effects after drug administration were studied until the animals returned to normal, 1 to 14 days. Dieldrin caused a prolonged dose-related loss of motor coordination indicated by inability to remain on a rotating rod, but lead and DDT had only minor effects. However, combinations of lead with DDT or with dieldrin markedly impaired motor coordination which was dose and time related. Corroborative results were obtained from experiments on mice forced to swim to exhaustion. Since mechanism for the impaired motor performance could be central or peripheral in origin, studies on rat nerve-tibialis muscle preparation in situ were undertaken 1, 2, and 4 days after dosing. Response characteristics, including single twitch/tetanus tension, stimulus frequency to develop tetanus, and absolute and relative refractory periods of the neuromuscular preparations, changed little compared to controls. The neurological deficit seems to be in the central nervous system. (Abstracts of papers presented at the 1974 fall meeting of the American Society for Pharmacology and Experimental Therapeutics, Inc., Abstract No. 094, abridged).

74-2914. Joy, R. M. (Univ. California, Davis, CA 95616). **Action of dieldrin on the cortical responses to antidromic pyramidal tract stimulation.** *Pharmacologist 16(2): 228; 1974.*

Pyramidal tract stimulation evokes a characteristic positive-negative response over the sigmoid gyri of the cat. The surface negative (SN) wave is recruited by short trains of stimuli and has been correlated with recurrent collateral inhibition within a population of pyramidal cells. Dieldrin (i.v.) did not markedly alter the SN wave. In 6 experiments the amplitude of the SN wave just prior to a spontaneous seizure was 97±5% of control. Time to peak amplitude and duration of the SN wave were not affected. Recovery cycle analysis demonstrated a facilitation in recovery time after dieldrin. Changes were most apparent with stimulus intervals between 25-50 msec. These experiments indicate that preconvulsive levels of dieldrin do not depress the SN wave of the antidromic pyramidal tract response. To the extent that this response correlates with cellular inhibitory synaptic events, then dieldrin does not reduce or suppress the activity of recurrent collateral inhibition on cortical pyramidal neurons. (Abstract No. 210)

74-2915. Johnson, M. C.; Dutta, S. N.; Frawley, J. P. (Hercules Inc., Wilmington, DE 19899). **Effects of barbiturates on convulsions induced by chlorinated hydrocarbon insecticides.** *Pharmacologist 16(2): 229; 1974.*

The usefulness of pentobarbital and phenobarbital in treating chlorinated hydrocarbon-induced convulsions was studied using male Wistar rats and 3 typical chlorinated hydrocarbon insecticides: toxaphene, DDT, and chlordane. Each insecticide was administered p.o. by intubation. Pentobarbital or phenobarbital in sedative and anesthetic doses were administered i.v. immediately after appearance of the first convulsions. At sedative dose levels, phenobarbital (25 mg/kg) treated animals had smaller numbers of toxaphene-induced convulsions than pentobarbital (10 mg/kg) treated rats. At one-half the anesthetic dose (50 mg/kg) phenobarbital totally blocked the subsequent convulsions in the majority of rats while pentobarbital did not. (Abstract No. 217)

74-2916. Thomas, J. A.; Schein, L. G.; Colby, H. D.; Canady, W. J. (West Virginia Univ. Med. Cent., Morgantown, WV 26506). **Interaction of dieldrin and parathion on androgen metabolism in the prostate and on hepatic P-450 activity in mice.** *Pharmacologist 16(2): 229; 1974.*

Different doses and dose regimens of dieldrin (2.5 mg/kg daily X 5 or 10-p.o.) and/or parathion (2.5 mg/kg daily X 5 or 10-p.o.) altered the metabolism of testosterone-H^3 by the prostate gland and the liver of mature male mice. The in vitro metabolism of testosterone-H^3 to its principal radiometabolites by prostate glands obtained from mice previously treated simultaneously with dieldrin and parathion was significantly increased. A similar increase was observed when dieldrin was administered for 5 days followed by a similar period of parathion treatment. Dieldrin alone, but not parathion alone, caused a significant increase in testosterone hydroxylase activity in hepatic microsomes. Dieldrin alone, but not parathion alone, significantly increased hepatic microsomal protein and cytochrome P-450 concentration. The simultaneous administration of dieldrin and parathion produced effects similar to that produced by dieldrin alone. (Author No. 219)

74-2917. Cohen, S. D.; Ehrich, M. (Univ. Connecticut, Sch. Pharmacy, Storrs, CT 06268). **Cholinesterase and carboxylesterase inhibition by dichlorovos and interactions with malathion and triorthocresyl phosphate.** *Pharmacologist 16(2): 229; 1974.*

Potentiation of toxicity after exposure to combinations of organophosphates may result from the one organophosphate's inhibiting the carboxylesterases which would either bind or hydrolyze the second organophosphate. To determine dichlorvos' potential for organophosphate interaction, the dose and time related inhibition of cholinesterase and carboxylesterase were studied in male mice. Brain cholinesterase activities were 37, 36, 50, 69, and 92% of control at ¼, ½, 2, 5, and 18 hr after i.p. injection of 30 mg/kg dichlorvos, respectively. Dichlorvos (35 mg/kg) killed mice in less than ½ hr. Eighteen hr after 30 mg/kg dichlorvos the hydrolysis rates of triacetin, diethylsuccinate and procaine by liver were 82, 52, and 84% of controls. The anticholinesterase action of 800 mg/kg of malathion was not potentiated by pretreatment 18 hr previously with 30 mg/kg dichlorvos, nor did malathion pretreatment potentiate dichlorvos' anticholinesterase action. Pretreatment with triorthocresyl phosphate did not potentiate dichlorvos' anticholinesterase action. These results suggest that dichlorvos neither potentiates nor is potentiated by other organophosphates. (Abstract No. 220)

74-2918. Bus, J. S.; Gibson, J. E. (Dept. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Involvement of oxygen and lipid peroxidation in the toxicity of paraquat in mice.** *Pharmacologist 16(2): 230; 1974.*

The effect of oxygen on the survival of developing mice chronically treated with paraquat and tissue levels of malondialdehyde was examined in adult mice after acute paraquat treatment. Paraquat was placed in the water supply of pregnant Swiss Webster mice at 0, 50 and 100 ppm beginning on day 8 of gestation and was offered to the litters for 40 days postnatally. Mice were exposed to 100% oxygen at 1 atm. beginning on days 28 and 42 postnatally. The median lethal time (LT50) for 42-day-old controls exposed to oxygen was 160 hr and for 50 and 100 ppm mice, 108 and 40 hr, respectively. The LT50s of 50 and 100 ppm paraquat mice were significantly different from each other and from controls. The LT50 for 28 day old 100 ppm mice was 121 hr, significantly less than the control LT50 of 181 hr. Tissue lipid peroxidation in adult mice 24 hr after 44 mg/kg i.p. paraquat (7 day LD90) was estimated by malondialdehyde formation. Paraquat increased lung malondialdehyde to 506 nmoles/g tissue compared to 452 for

controls. Liver malondialdehyde was signficantly increased from a control value of 276 to 768 nmoles/g in paraquat treated mice tissue. Kidney malondialdehyde remained unchanged. The enhancement of paraquat toxicity by oxygen and increased formation of malondialdehyde after acute paraquat treatment indicates that oxygen and lipid peroxidation are involved in the mechanics of paraquat toxicity. (Abstract No. 222)

74-2919. Preache, M. M.; Gibson, J. E. (Dept. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Alteration of dinoseb-induced toxicity and teratogenicity in mice by environmental stress conditions.** *Pharmacologist 14(2): 230; 1974.*

The herbicide 2-*sec*-butyl-4,6-dinitrophenol (dinoseb) is teratogenic in mice at doses at or near those required for maternal toxicity. Environmental stress conditions were combined with dinoseb treatment of pregnant mice to determine their effect on dinoseb-induced maternal or fetal toxicity and on teratogenicity. Dinoseb (0-17.7 mg/kg/day) was administered on days 10, 11, and 12 of gestation. Forcing the mice to swim for 2 hr immediately after day 11 treatment caused significant reduction in the percent incidence of external, soft tissue, and skeletal anomalies. Reducing the ambient temperature to 4°C for 2 hr following each dinoseb treatment had no effect on maternal deaths or on teratogenicity. Increasing the ambient temperature to 32°C for the 24 hr period following the day 11 dinoseb treatment lowered the dose requirement for maternal lethality and embryotoxicity but had no effect on teratogenicity. The dissociation of dinoseb toxicity from its teratogenicity by the failure of increased temperature to alter the latter is reminiscent of the failure of 2,4-dinitrophenol (like dinoseb, a potent uncoupler of oxidative phosphorylation) to produce teratogenic effects in mice. (Abstract No. 223)

74-2920. Cagen, S. Z.; Gibson, J. E. (Dept. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Effect of paraquat (methyl viologen) on plasma disappearance of sulfobromophthalein (BSP) and indocyanine green.** *Pharmacologist 16(2): 266; 1974.*

To determine the effect of paraquat on hepatic excretion of BSP and indocyanine green, a 7-day LD50 (126 mg/kg) dose of paraquat was administered to rats, and 2 or 32 hr later, plasma disappearance of BSP was compared to that in untreated rats. BSP (120 mg/kg) was administered to anesthetized rats via the femoral vein, and serial blood samples were obtained through the femoral artery. Body temperature was maintained at 37°C to prevent hypothermic alteration of biliary flow. Significant retention of BSP compared to controls was observed in the plasma of rats treated with paraquat 32 hr, but not 2 hr before BSP. To further characterize this effect, the plasma disappearance of inocyanine green was determined in rats treated with paraquat 32 hr before indocyanine green. The indocyanine green plasma disappearance was unaffected by paraquat. These data suggest that paraquat may affect BDP metabolism and thus impair its biliary excretion rather than causing a generalized alteration in hepatic excretory function (Abstract No. 433)

74-2921. Ecker, J. L.; Gibson, J. E.; Clark, R. L.; Hook, J. B. (Dept. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Effect of paraquat (methyl viologen) on in vitro measures of renal function.** *Pharmacologist 16(2): 266; 1974.*

Paraquat produces renal proximal tubular necrosis and renal dysfunction. Paraquat renal elimination may involve an active secretory component. Paraquat selectively inhibited mouse renal cortical slice uptake (S/M) of *N*-methylnicotinamide at 25°C without affecting *p*-aminohippurate uptake. However, at 37°C both *p*-aminohippurate and *N*-methylnicotinamide accumulation were inhibited by high concentrations of paraquat, suggesting a general depression of cellular function. To further characterize this effect of paraquat added in vitro, oxygen consumption by renal cortex slices was measured for 10 min following incubation with paraquat. Preincubation of slices for 1 hr at 37°C in the presence of $10^{-3}M$ paraquat depressed oxygen consumption (0.48 μl/min/mg tissue) compared to $10^{-4}M$ paraquat (.062) and controls (.069). Paraquat addition without preincubation did not affect oxygen consumption. Acute or chronic administration of paraquat to mice had no effect on the *p*-aminohippurate and *N*-methylnicotinamide S/M ratios. Thus, if animals survive an LD50 dose, no functional nephrotoxic effects are detectable in vitro. (Abstract No. 434)

74-2922. Bachmann, K. A.; Burkman, A. M. (Div. Pharmacol., Ohio State Univ. Coll. Pharm., Columbus, OH 43210). **Topical application of a chlordane containing ectoparasiticide: effect on plasma half-life of warfarin in dogs.** *Pharmacologist 16(2): 284; 1974.*

Brief exposure of dogs to topically applied 0.32% chlordane solutions decreased the biological half-life of orally administered warfarin (0.8 mg/kg). This effect is probably an expression of chlordane's inductive effect on hepatic microsomal drug-metabolizing enzymes and its long-term storage in fat deposits. The ease with which chlordane is absorbed through the intact skin of dogs may render casually treated animals unsuitable for subsequent pharmacologic study for long periods of time. (Abstract No. 533)

74-2923. Kacew, S.; Witschi, H. (Dept. Pharmacol., Univ. Montreal, Montreal, Quebec, Canada). **Acute paraquat poisoning: influence on selected pulmonary enzymes.** *Pharmacologist 16(2): 299; 1974.*

Injury to lung tissue by oxidants increases the

activity of pulmonary pentose shunt and glycolytic enzymes. Whether similar metabolic responses occur in lungs damaged by paraquat was examined in rats given 20, 40, and 60 mg/kg of paraquat i.p. The specific and total activities of glucose-6-phosphate dehydrogenase, isocitric dehydrogenase, pyruvate kinase, and lactic dehydrogenase were determined 8, 12, 18 and 24 hr later. Inconsistent changes in the activities of pulmonary pyruvate kinase and lactic dehydrogenase were produced by 40 and 60 mg/kg paraquat. However, isocitric dehydrogenase and particularly glucose-6-phosphate dehydrogenase activities were increased as early as 12 hr after 40 or 60 mg/kg paraquat; the 20 mg/kg dose elevated these enzymes after 18 hr. Changes in glucose-6-phosphate dehydrogenase may reflect the capacity of lung cells to recover from oxidant inflicted damage; this may account for the events observed following acute exposure to paraquat. (Abstract No. 620)

74-2924. Mikhaylova, Ye. I.; Kruglov, Yu. V. (All-Union Sci. Res. Inst. Agriculture Microbiol., USSR). **Vliyaniye nekotorykh gerbitsidov na al'gofloru pochvy. [Effect of some herbicides on soil algoflora.]** *Pochvovedenie 8: 81-85; 1973.* (7 references) (Russian)

The effects of atrazine, monuron, carbothion, and eptam (EPTC) were studied on soil algoflora. Eptam stimulated the algal growth and did not cause qualitative changes in the algal population. Atrazine, monuron, and carbothion nearly quantitatively suppressed the development of microscopic algae. The effects were dependent on chemical structure and algal species and eventually changed the species composition of the algoflora. *Navicula atomus* was most resistant to monuron; *Chlorococcum* species and *N. atomus* were resistant to atrazine; *Chlorococcum* and *Phormidium* species were most resistant to carbothion.

74-2925. Polakowski, P. (Dept. Pharmacol., Acad. Med., Lodz, Poland). **Wlasciwosci farmakologicz ne ditizonu i jego wplyw na wydalanie oraz rozmieszczenie w tkankach niektorych metali w zatruciu doswiadczalnym. [Pharmacological properties of dithizone and its influence on excretion and distribution of various metals in tissues after experimental poisoning.]** *Pol. Tyg. Lek. 29(5): 199-200; 1974.* (13 references) (Polish)

The toxicity and pharmacodynamic properties of dithizone, an antidote for heavy metal poisoning, were studied after oral and parenteral administration to 210 BALB/c mice, 324 Wistar rats, 70 rabbits, 13 cats, and 5 dogs. The LD50 was 1050 ± 175 mg/kg for rats and 130 ± 29 mg/kg for mice. After i.v. injection into rabbits (20, 40, or 160 mg/kg) dithizone disappeared from the blood at a steady rate, with a half life of 18 min. Oral administration to rabbits (20 mg/kg) caused a gradual decrease in leukocytes and a relative increase in lymphocytes. After 10 days of administration there was a marked increase in SGOT and SGPT (to 470% and 364% of the norm, respectively). Intravenous injection of 100 mg/kg caused death of rabbits through hypo- or hyperglycemia, while oral administration for 10 days had no effect on glucose tolerance. A 20 mg/kg day oral dose for 10 days caused an 80% shift to the left in the electrical axis of the heart, and the EKG indicated myocardial damage. Injection of 5-100 mg/kg into dogs and cats caused a temporary arrest of respiration with a marked drop in blood pressure. Oral administration to rats caused a decrease in accumulation of iodine in the thyroid. In comparison to controls, a 20 mg/kg dose in rats caused a 65% increase in total excretion of indium, 41% of thallium, 39% of iron, 32% of cadmium, 21% of mercury, and 19% of gold. Urinary excretion increased by 118% for iron, 57% for thallium, and 31% for mercury. Excretion in feces increased 110% for indium, 32% for gold, 29% for cadmium, and 23% for thallium. Administration of 40 mg/kg increased the percentage of fecal excretion of thallium (59%). The amounts of excreted cobalt, manganese, lead, and bismuth did not change; the amounts of silver decreased by 40%, copper by 29%, zinc by 18%, and tin by 20%.

74-2926. Balicka, N.; Golebiowska, J. (Dept. Agricultural Microbiology, Acad. Agr., Wroclaw, Poland). **Dzialanie herbicydow na drobnoustroje glebowe w swietle badan prowadzonych w Polsce. [The effect of herbicides on soil microbial populations based on studies carried out in Poland.]** *Postepy Mikrobiol. 11(1): 117-136; 1972.* (53 references) (Polish)

Studies on the effect of herbicides on the microbial population of soil are extensively reviewed. It is stressed that results of field studies are difficult to assess because of the great number of other contributing environmental factors. The quantities of herbicides used in the laboratory are usually much greater than those used in practice. Soil microorganisms apparently are much more resistant than other organisms to herbicides. Algae are most sensitive. There is no definite proof that herbicides affect the numbers or viability of soil bacteria, or that they have a long-term effect on nitrifying, denitrifying, proteolytic, or cellulose-decomposing microorganisms. Quantitative changes were only seen when very large amounts were used. Smaller amounts sometimes caused changes in cell metabolism, affecting respiration and ability to produce antibiotics or amino acids. Although it is difficult to compare the effect of different types of herbicides because of the variety of environmental factors, it seems that those from the urea and carbamate group have a stronger effect than those which are derived from organic acids. The least harmful are triazine herbicides such as simazine, prometryne, and pyramin (pyrazon).

74-2927. Lowndes, H. E.; Riker, W. F. Jr.; Baker, T. (Dept. Pharmacol., Cornell Univ. Med. Coll., New York, NY). **Alterations in neuromuscular function in delayed**

organophosphate toxicity. *Proc. Can. Fed. Biol. Soc. 16: 8; 1973.*

Certain organophosphates induce a delayed peripheral neuropathy, histologically evidenced by degeneration of peripheral nerves. Cats were given diisopropylphosphorofluoridate by close intra-arterial injection, and soleus nerve-muscle preparations were used to examine neuromuscular function during the onset and recovery phase of the neuropathy. Post-tetanic repetition and post-drug repetition which depend on the motor nerve terminal for their initiation and maintenance were severely depressed after diisopropylphosphorofluoridate administration. The associated muscle phenomena of post-tetanic potentiation and postdrug potentiation were markedly attenuated. Deficiency in motor nerve terminal function was maximal three weeks after exposure. A recovery phase was essentially complete in eight weeks. No other neuromuscular function parameters were impaired. The results indicate that the initial lesion in the neuromuscular apparatus in delayed organophosphate toxicity occurs at the level of the motor nerve terminals.

74-2928. Linder, R. L.; Greichus, Y. A. (Exp. Sta. Biochem. Dept., South Dakota State Univ., Brookings, SD 57006). **Tests on learning ability of the white pelican.** *Proc. S. Dak. Acad. Sci. 51: 132-135; 1972.* (4 references)

A study was conducted to determine if learning and discrimination testing would be feasible for an evaluation of effects of pesticides on behavior of penned pelicans. The birds were preconditioned to respond to a red triangle in their cages by placing a red plexiglas triangle on the bucket of fish from which they fed. Following various tests with the red triangle, the symbol was changed to a red circle. Later a red triangle and a red circle were the stimuli used in discrimination tests, with the red triangle reinforced by feeding of fish. The results of this testing indicate that white pelicans can readily learn to discriminate between stimuli, responding to those that result in reinforcement and rejecting those that offer no reward. It should be possible to measure these parameters and compare behavioral characteristics between groups of penned pelicans with and without pesticide treatment.

74-2929. Prescott, L. M.; Olson, D. L. (Biol. Dept., Augustana Coll., Sioux Falls, SD 57102). **The effect of pesticides on the soil amoeba *Acanthamoeba castellanii* (Neff).** *Proc. S. Dak. Acad. Sci. 51: 136-141; 1972.* (8 references)

The effects of 0.1, 1, 10, and 100 ppm of the following pesticdes on the soil ameba *Acanthamoeba castellanii* (Neff) were studied: DDT, atrazine, 2,4-D, eptam (EPTC), propham (IPC), monuron, and stam F-34 (propanil). Monuron did not affect growth at levels up to 10 ppm; atrazine greatly inhibited growth at 0.1 ppm and was almost completely and immediately lethal at 1 ppm. Eptam and DDD (TDE) had little or no significant inhibitory effects at lower concentrations, but did inhibit growth at concentrations of 10-100 ppm; DDT was more toxic than eptam. 2,4-D appeared to stimulate growth at 0.1-1.0 ppm, but the stimulation was much less pronounced at 10-100 ppm. *Acanthamoeba* may be able to degrade 2,4-D and use it as a carbon and/or energy source. The effects of IPC and stam F-34 were variable although both herbicides appeared to inhibit growth significantly at levels of 10-100 ppm.

74-2930. Goldman, M.; Bubak, P.; Meiberger, H. (Dept. Biol., Univ. South Dakota, Vermillion, SD 57069). **Comparative effects of environmental pollutants: mercury, lead, and DDT on thyroid uptake of radioiodine and thyroid secretion rate in male Sprague-Dawley rats.** *Proc. S. Dak. Acad. Sci. 51: 263; 1972.*

Long term dietary ingestion of mercuric chloride (100 mg/kg) for 2-3 months or 1% lead acetate for 1 yr decreased thyroidal ^{131}I uptake 24 hr after injection of radioiodide and reduced the rate of thyroidal ^{131}I release. These indices of thyroid function were more marked in those animals ingesting lead acetate. Removing the mercury supplement from the diet of one group of rats and testing the ^{131}I release rates again three months later showed that the mercury ingestion had some permanent effects on thyroid function. A single dose of technical grade DDT completely inhibited the release of thyroidal ^{131}I from prelabeled thyroid glands within 8 to 10 hr after administration by stomach tube. This delay continued for 24-30 hr, after which time thyroidal release of ^{131}I returned to previous control rates. Repeated daily dosing with mercuric chloride (10 mg/kg) by stomach tube for 5-7 days accelerated thyroidal ^{131}I release.

74-2931. Lyubenov, Ya. (Inst. Plant Protection, Kostinbrod, Bulgaria). **Vliyanie na kherbitsidite vurkhu kulturnite rasteniya i vurkhu kachestvoto na poluchenata produktsiya. [Effect of herbicides on cultivated plants and the quality of the obtained product.]** *Rastit. Zasht. 21(3): 37-41; 1973.* (Bulgarian)

Studies on the persistence, migration, toxicity, and metabolism of herbicides in plants and animals are reviewed. 2,4-D and MCPA were rapidly metabolized in plants due to degradation, introduction of hydroxy group into the aromatic ring, or the formation of complexes with cell substances, such as proteins, glucosides, and amino acids. Both 2,4-DB and MCPB are rapidly degraded by microorganisms and plant enzymes. The use of technical 2,4,5-T is prohibited or restricted in many countries due to its dioxin content. Triazines are considered harmless since they are metabolized rapidly in plants and in animals by hydrolysis, dealkylation, or cleavage of the heterocyclic ring. Carbamates are progressively dealkylated in plants, and the dealkylation

products are subsequently hydrolyzed to the corresponding anilides which either form complexes with plant cell substances or are oxidized. In animals carbamate residues are metabolized mostly by dealkylation and by hydrolysis to a lesser degree. The carbamate residues in plants are usually negligible. Ronit (Ro-neet) and vapam (metham) are assumed to be metabolized rapidly into mercaptan, carbon dioxide, and dialkylamine. Dalapon, not metabolized in plants, has very low toxicity in animals and is excreted in the urine very rapidly. Similarly, treflan was also rapidly excreted from the animals. Gramoxone (paraquat) and reglone (diquat) usually give low residue levels in plants due to their limited migration. Unlike dicamba, 2,3,6-trichlorobenzoic acid (2,3,6-TBA) is metabolized in plants rather slowly.

74-2932. Milhaud, G. (Author address not given). **Toxicite du Gramoxone. [Toxicity of gramoxone.]** *Rec. Med. Vet. 150(4): 337; 1974.* (French)

General problems and data on the toxicity of paraquat (gramoxone) are presented. The acute oral LD50 of paraquat was 100-160 mg/kg for rats, 125 mg/kg for rabbits, and 250 mg/kg for fowl. Hares are sensitive to paraquat, with an LD50 of 5 mg/kg, and are particularly threatened by ingestion of paraquat-contaminated grass. Ingested, paraquat causes buccopharyngeal irritation, reversible epithelial nephritis with oligoanuria and without edema, and, finally, irreversible and progressive pulmonary sclerosis which causes death in about three weeks. The acceptable daily intake has been set at 0.0007 mg/kg.

74-2933. Kimbrough, R. D.; Linder, R. E. (Cent. Disease Control, Toxicol. Br., Atlanta, GA 30333). **The toxicity of technical hexachlorobenzene in the Sherman strain rat. A preliminary study.** *Res. Commun. Chem. Pathol. Pharmacol. 8(4): 653-664; 1974.* (14 references)

Technical grade hexachlorobenzene (HCB) was fed to groups of 10 male and 20 female weanling specific pathogen-free Sherman rats at dietary levels of 0, 100, 500, and 1000 ppm for 4 months. None of the control animals and none of those fed 100 ppm HCB died as a result of the treatment. However, two of the males and 14 of the females fed 5000 ppm died, as did three of the males and 19 of the females fed 1000 ppm. Compared with the control group, the livers, spleens, adrenals, lungs, and kidneys of the 500 and 1000 ppm groups were heavier. Various morphological changes were also observed in the livers of these animals. In addition, hyperplasia of the adrenal cortex, large numbers of macrophages in the pulmonary alveoli, and lung fibrosis were noted. Since the HCB fed to these animals was only 93-95% pure, additional studies are necessary to determine whether the observed pathology is entirely due to the effects of the pesticide.

74-2934. Benke, G. M.; Murphy, S. D. (Dept. Physiol., Kresge Cent. Environ. Health, Harvard Sch. Pub. Health, Boston, MA 02115). **Effect of TOTP pretreatment on paraoxon and methyl paraoxon detoxification in rats.** *Res. Commun. Chem. Pathol. Pharmacol. 8(4): 665-672; 1974.* (13 references)

Previous reports have indicated that i.p. pretreatment with triorthotolyl phosphate (TOTP; tri-*o*-cresyl phosphate) potentiates the toxicity of paraoxon in rats and mice, presumably by depressing the so-called "binding" mechanism of paraoxon detoxification. The effects of TOTP on alternate detoxification systems, including A-esterases and glutathione-*S*-alkyl- and *S*-aryltransferases, were investigated using adult male Holtzman rats. The animals were given 125 mg/kg TOTP i.p. and 16 hours later challenged with methyl paraoxon or paraoxon. The toxicity of both pesticides was potentiated more than 2-fold by the TOTP pretreatment. TOTP (125 mg/kg) had no significant effects on the rates of the liver or plasma hydrolysis of paraoxon and methyl paraoxon by A-esterases, or on GSH-dependent liver enzymes. Thus, TOTP appears to act solely via effects on the plasma and/or liver binding of paraoxon or methyl paraoxon.

74-2935. Dvorak, P. (Inst. of Higher Education for Animal Production, Uhrineves, Czechoslovakia). **Dekorporierung von Thallium durch rhyolithischen Bims bei der Ratte. [Removal by rhyolitic pumice of internally deposited thallium from the rat.]** *Res. Exp. Med. 162(1): 63-66; 1974.* (8 references) (German)

The efficiency of rhyolitic pumice was studied in a fraction below 0.1 mm in the reduction of the retention of thallium in the organs and tissues of male Wistar rats. The animals were given a feed with 2, 5, 10, and 15 weight per cent pumice ad libitum, starting 48 hr before or 1 hr after oral administration of an aqueous solution of ^{204}Tl-labeled thallium sulfate at a rate of 7.2 μmole/kg (corresponding to 1/5 of LD50). The rate of thallium retention in the liver, kidney, and musculature was efficiently diminished by pumice, especially when administered the first 48 hr before poisoning. The efficiency of the pumice was highest on the 7th day of the experiment which indicates inhibition of both primary resorption and recurrent resorption of the thallium present in the intestines. A clear dose-effect relationship for pumice was established. Rhyolitic pumice was surpassed in its effect by ferrihexacyanoferrate (II) which was efficient in lower doses than pumice.

74-2936. Denys, A.; Guilbert-Ber, E.; Levy, J. (Service de Jeanne Levy et de L. Buchel, Institut de Pharmacologie, Paris, France). **Caracteres de l'induction enzymatique provoquee chez la Souris par le chlordane. III. Influence de l'electrochoc chez des souris induites par le chlordane. [Characteristics of enzyme induction**

by chlordane in mice. III. Influence of electroshock in mice induced by chlordane.] *Therapie 28(6): 1233-1250; 1973.* (20 references) (French)

The influence of electric shock was studied in mice after enzyme induction by chlordane. The animals were given either a single dose of 2.5, 5, or 7.5 mg/kg, three doses of 2.5 mg/kg in 3 days, or 2.5 mg/kg of chlordane per day chronically. Regardless of the mode of chlordane administration, electric shock always caused greater or lesser, but always significant, reductions in duration of sodium pentobarbital-induced sleep or zoxazolamine-induced paralysis. The effect of electric shock was detectable for 21 days. The effects of electric shock are controlled by ethionine administered 30 min before stress. The reduction of the duration of sleep or paralysis under the influence of electric shock in chlordane treated animals is due to hepatic microsomal enzyme activation. This in turn may be a result of the mobilization of chlordane in the adipose tissues where it had accumulated. Electric shock is capable of increasing the level of previously acquired induction, and its effects are similar to those of repeated doses of chlordane.

74-2937. Helweg, A. (Bakteriol. Afd., Statens Planteavls.-Lab., Copenhagen, Denmark). **Undersogelser over fungicidet benomyl i jord. II. Benomyls indflytelse pa jorbundens mikroflora. [Studies on the fungicide benomyl in soil. II. The influence of benomyl on the soil microflora.]** *Tidsskr. Planteavl. 77(3): 375-381; 1973.* (Danish)

The effect of benomyl was studied on the soil microflora. When present in concentrations below 1,000 ppm, neither benomyl nor its metabolite, BCM, inhibited the carbon dioxide release. Benomyl concentrations of 1,000 ppm and over increased the CO^2 release. When present in the soil in 100 ppm concentration, benomyl failed to inhibit the degradation of ^{14}C-labeled cellulose at a soil pH of 7.2, but caused considerable inhibition of the cellulolytic process for 2 weeks at a soil pH of 5.3. Benomyl in concentrations of 10-1,000 ppm did not interfere with the ammonification and nitrification processes. In concentrations of 10 and 100, benomyl did not cause significant changes in the number of Rhizobium species in soil samples from alfalfa and clover fields.

74-2938. Morris, J. E. (Wildlife Sci., Columbia, MO). **The ecological and physiological effects of insecticides on Missouri mammals.** *Trans. Mo. Acad. Sci. 6: 166; 1972.*

Pen studies with cottontail rabbits on plots treated with dieldrin at 0, 1/2, and 2 pounds/acre revealed possible toxicity to some rabbits after the initial application. No apparent effect was noted on surviving rabbits, and the reproduction capacity was not altered. Deer fed 0, 5, and 25 ppm dieldrin for 3 yr showed no toxic effects. Offspring of dieldrin treated deer had greater post-partum mortality, and fawn growth was impaired. The rates of conception and embryonic death were unchanged. By the end of the second winter, 17 of 40 female raccoons fed dieldrin at the rate of 0, 2, and 6 ppm in their daily feed had died of dieldrin poisoning, but only 2 of 30 males died. The reproductive capacity of the females was greatly reduced. This reduced productivity related to altered estrus cycles, reduced ovulation rates, reduced incidence of pregnancy, and increased resorption of embryos. A significantly higher incidence of deformed sperm was noted in dieldrin treated males. Reproductive behavior was altered with only 1 of 15 females responding normally to males. Residues in raccoon tissues suggest that raccoons did not concentrate residues to any great extent. The data suggests that raccoons, unlike deer and rabbits, are extremely sensitive to dieldrin residues. While raccoons are not generally exposed, altered food supplies by reduced availability of arthropods may explain reduced raccoon populations in the agricultural areas. This may be an indirect effect of the insecticides since arthropods are the primary target.

74-2939. Nepoklonov, A. A.; Metelitsa, V. K. (Author address not given). **O vydelenii khlorofosa s molokom korov pri naruzhnykh obrabotkakh. [Excretion of chlorophos in cow milk following external applications.]** *Tr. Vses. Nauch. Issled. Inst. Vet. Sanit. 39: 149-154; 1971.* (12 references) (Russian)

Dynamics of the excretion of trichlorfon and its metabolites in milk was studied following external treatment of cows with this preparation. Trichlorfon, DDVP, and an unidentified metabolite with an Rf value of 0.4-0.45 were found in milk samples after treatment using TLC and agar diffusion method. Following treatment with oil-alcohol solution of trichlorfon by the pour-on method at a rate of 20-24 ml or with 200 ml 8% aqueous solution by the same technique, pesticide residues were detected in the milk for 36 to 72 hr. Residues were detected in the milk for up to 84 hr after spraying with 1% aqueous solution at an expenditure of 2 liter per animal. After rubbing in 300 ml 4% aqueous solution by means of a brush, residues were detected in milk for 2 days by TLC and for up to 6 days by the agar-diffusion method.

74-2940. Nepoklonov, A. A.; Metelitsa, B. K. (Author address not given). **O metabolizme i srokakh sokhraneniya khlorofosa v organizme krupnogo rogatogo skota. [Metabolism and retention of chlorophos in cattle.]** *Tr. Vses. Nauch. Issled. Inst. Vet. Sanit. 39: 155-164; 1971.* (16 references) (Russian)

Residue dynamics were studied in different organs and tissues of cattle treated with trichlorfon by the pour-on method. The cattle were treated with 11.6% oil-alcohol solution or aqueous solution of trichlorfon at rates of 8-80 mg/kg body weight. Trichlorfon was detected in different organs and tissues, such as muscles,

heart, liver, kidney, lungs, spleen, testes, and mammary glands for 15 days using TLC and for up to 22 days using the agar-diffusion method. The trichlorfon residues were highest with 0.68-1.1 mg/kg for the first 4 days, after which the trichlorfon level decreased and DDVP (dichlorvos) and another unidentified metabolite appeared. Cattle treated with trichlorfon by the pour-on method should not be slaughtered within the first 21 days. To guarantee trichlorfon residues lower than 1 mg/kg, the meat of cattle slaughtered within this waiting period after treatment should be stored for 30 days at -4 to -5°C before consumption.

74-2941. Molochnikov, V. V.; Mochalov, V. I.; Talanov, G. A. (All-Union Sci. Res. Inst. Dairy Ind., USSR). **Vydeleniye gamma-izomera GKhTsG (lindana), DDT i TKhM-3 v moloke korov posle odnokratnogo vnutrennego vvedeniya etikh soyedineniy. [Excretion in cow milk of lindane, DDT and TCM-3 administered orally once.]** *Tr. Vses. Nauch. Issled. Inst. Vet. Sanit. 39: 173-179; 1971.* (4 references) (Russian)

The excretion of DDT, lindane, and TCM-3 in cow milk was studied after single oral administration of a combined dose containing 2 g lindane and TCM-3, and 3 g DDT. The excretion in milk amounted to 5.44% for lindane, 0.14% for TMC-3, and 8.14% for DDT, respectively. Most of the TCM-3 was excreted during the first day after administration, while the lindane and DDT excretions were most intense during the first week and first two weeks after administration, respectively. The highest TCM-3, lindane, and DDT levels in the milk were 0.16, 2.40, and 5.48 mg/liter. DDT was metabolized to DDE and DDD. The respective ratios of DDT, DDE, and DDD in the milk on the second day of the experiment were 24%, 3%, and 73%.

74-2942. Ryazhenov, N. I. (Author address not given). **O toksichnosti i kumulyativnykh svoystvakh analogov DDT. [Toxicity and cumulative properties of DDT analogs.]** *Tr. Vses. Nauch.-Issled. Inst. Vet. Sanit. 39: 193-195; 1971.* (5 references) (Russian)

The acute toxicity and cumulative properties of *p,p'*-DDT, *p,p'*DDE, and *p,p'*-DDD (TDE) were studied in albino mice. The oral LD50s were 240 mg/kg for *p,p'*-DDT, 680 mg/kg for *p,p'*-DDE, and 1,200 mg/kg for *p,p'*-DDD. The LDO values were 50 mg/kg for *p,p'*-DDT, 400 mg/kg for *p,p'*-DDE, and 800 mg/kg for *p,p'*-DDD. The corresponding LD100 values were 400 mg/kg, 1,000 mg/kg, and 1,600 mg/kg. While similar in their physiological effects to each other, the three DDT analogs were characterized by differences in the degree of their physiological effects which decreased in the order *p,p'*-DDD, *p,p'*-DDE, and *p,p*-DDD. General asthenia, excessive perspiration, muscular tremor, motor disorders, and death due to respiratory arrest were the successive symptoms of acute poisoning. The death rates in groups fed 1/10 LD50 of *p,p'*-DDT, and *p,p'*-DDD for 28 days were 40% and 50%; 60% of the animals died in 21 days in another group fed 1/10 LD50 of *p,p'*-DDE. Death did not occur from the 28th to the 48th day of the experiment, at which time no symptoms of poisoning were observed.

74-2943. Kan, P. T.; Simetskiy, M. A.; Il'yashchenko, V. I. (Author address not given). **Vliyaniye organicheskikh rastvoriteley akaritsidov na kozhu u kon"yunktivu krolikov. [Effect of organic acaricide solvents on the skin and ocular conjunctiva of rabbits.]** *Tr. Vses. Nauch. Issled. Inst. Vet. Sanit. 39: 369-372; 1971.* (Russian)

The irritating effect of organic solvents used in the preparation of acaricide emulsions on the skin and ocular conjunctiva of rabbits was studied by the trypan blue and fluorescein methods. Xylene, *para*-xylene, solvent naphtha, heavy solvent, and polymers (heavy xylene fraction) caused serious skin irritation, while cyclohexanone produced transient irritation, and ethylene glycol monoethyl ether as well as white spirit produced slight skin irritation. Therefore, the use of these solvents in acaricide preparations should be abandoned or minimized. The medium fraction of coal-tar oil, spindle oil, and refined mineral oil, as well as butanol and dioxol had no irritative effect. Both 30% concentrated dicresyl No. 2 and a 1% emulsion of this compound in water had irritative effects on the ocular conjunctiva, while the 30% homogenized preparation No. 1 (in coal-tar oil) and its 1% emulsion in water were innocuous to the conjunctiva.

74-2944. Hadzovic, S.; Pesic, V.; Brankov, K. (Vet. Fac., Univ. Sarajevo, Sarajevo, Yugoslavia). **Aktivnost holinesteraze kod teladi nakon akutnog otravanja sarinom. [Cholinesterase activity in calves following acute poisoning with sarin.]** *Veterinaria (Sarajevo) 22(2): 207-211; 1973.* (26 references) (Serbocroatian)

The intra vitam and post mortem cholinesterase activities were determined in whole blood, tissues, and organs of calves after acute poisoning with 4X LD50 of sarin administered i.v. Total inhibition of the cholinesterase activity in striated muscles; almost total inhibition in the frontal part of the cerebral cortex, heart, and whole blood; somewhat lower degree of inhibition in the spleen, lungs, and kidney; and lowest degree of inhibition in the liver were determined. The intra vitam diagnosis of organophosphorus poisoning can be established best by determining the cholinesterase activity in the whole blood, and the post mortem diagnosis by determining this activity in the brain, heart, blood, or spleen.

74-2945. Reinhardt, P.; Thiemann, K. G.; Ruscher, H. J.; Betke, P. (Bezirksinstitut fuer Veterinaerwesen, Frankfurt/Oder, DDR). **Untersuchungen zur akariziden**

Wirksamkeit, klinischen Vertraeglichkeit und Rueckstandsdynamik des Praeparates Pedix-Butonat beim Huhn. [Studies on acaricidal action, clinical safety, and residue dynamics of Pedix-Butonate with regard to fowl.] *Monatsh. Veterinaermed. 29(6): 201-204; 1974.* (15 references) (German)

Chickens were used to study the efficiency, clinical safety, and residue dynamics of Pedix-Butonate, an acaricide. The trichlorfon residue in muscles, measured 3 hrs after spraying the fowl-houses with 100 ml 5% butonate per m^2, was at a tolerable level, below 0.002 ppm. The residue level fell to below the limit of detectability one day after application. In another test in which eggs were submerged in butonate solution, the butonate, trichlorfon, and dichlorvos (the latter breakdown products) residues were 0.02 ppm, 0.009 ppm, and 0.001 ppm, respectively, during the first 8 days. The butonate level was highest with 0.08 ppm on the 12th day. No residues were detected after 15 days. No hygienic limitation or waiting times are necessary regarding the application of butonate as an acaricide in fowl-houses.

74-2946. Antsiferov, S. D.; Zhavoronkov, N. I.; Akulov, A. V.; Yevdokimov, S. M. (All-Union Inst. Exp. Vet., USSR). **Toksicheskoye deystviye tetrametiltiuramdisul'fida na ovets. [Toxic action of tetramethylthiuram-disulfide on sheep.]** *Veterinariya (Moscow) 7: 90-91; 1973.* (Russian)

The acute oral toxicity of TMTD (thiram) in sheep was studied with the LD50 being determined at 225 mg/kg. Acute poisoning tests with 300, 400, and 500 mg/kg doses reduced the DNA level in the blood 40% and the RNA level 25% and increased the free nucleotide content 40% and the phosphorus level 30%. Anorexia and cachexia, the first symptoms of poisoning, appeared during the first hours, after which the symptoms either intensified or disappeared in 2 to 3 days. Pathoanatomical and histological examinations of autopsy materials revealed derangement in the hemodynamics and the development of dystrophic and necrotic processes in the parenchymatous organs.

74-2947. Konyukhov, A. F.; Poloz, D. D.; Kokhtyuk, F. P. (All-Union Inst. Exp. Vet., USSR). **Metabolizm antio v organizme kur. [Metabolism of formothion in chickens.]** *Veterinariya (Moscow) 4: 108-109; 1974.* (Russian)

The metabolism and residue dynamics of anthio (formothion) in chickens were studied. Quantitative metabolism of formothion to dimethoate was determined in organ and tissue samples, including liver, brain, skeletal muscles, and gastric contents 24 hr after oral administration of 110 mg formothion per kg body weight (LD100). In another group that had been poisoned with lethal doses, and subsequently treated with antidotes (tropazine and dipyroxime), dimethoate was detected during the first four days, but not any longer on the sixth day after poisoning. Neither formothion nor dimethoate was detected in chickens investigated 20 days after administration of a single 50 mg/kg dose. The analysis of the gastric contents is most appropriate for the diagnosis of poisonings by formothion and dimethoate in chickens.

74-2948. Torchinskiy, A. M. (Lab. Toxicol. and Pestic., Inst. of Nutrition of the USSR Acad. Med. Sci., Moscow, USSR). **Rol' diet s razlichnym soderzhaniyem belka v proyavlenii teratogennogo i embryotoksicheskogo deystviya nekotorykh pestitsidov. [Significance of diets with different protein content in manifestations of teratogenic and embryotoxic action of some pesticides.]** *Vop. Pitan. 3: 76-80; 1973.* (17 references) (Russian)

The teratogenic and embryotoxic action of benlate and carbaryl in Wistar rats as affected by the protein level in the diet was studied. The animals were kept on diets with 5, 10, 19, and 35% protein either for one month prior to mating and during the entire pregnancy or only during pregnancy. Benlate was administered in doses of 250 and 145 mg/kg body weight on the 12th day of pregnancy, and carbaryl was fed in a dose of 106 mg/kg daily from the first to the 20th day of pregnancy. The teratogenic and embryotoxic action of benlate and carbaryl did not change in groups where the females received the diet containing 5, 10, or 19% protein from the very beginning of pregnancy. An increased spontaneous post-implantational lethality of the embryos was noted in females kept on a diet with 5% protein since one month before conception. When these animals were exposed to the effect of carbaryl, the weight of 20-day-old fetuses declined considerably, yet the intensity of the teratogenic action of benlate did not increase under these conditions. The teratogenic action of benlate and the embryotoxic action of carbaryl were less strong in animals which had been receiving a diet with 10% protein since one month before conception than in the groups kept on diets with 19 and 35% protein.

74-2949. Kamenko, V. M. (Pathomorphological and Histochemical Lab., Kiev Sci. Res. Inst. Renal and Urinary Tract Pathol., Kiev, USSR). **Morfologicheskiye i gistokhimicheskiye izmeneniya v pochkakh pri ostroy pochechnoy nedostatochnosti, vyzvannoy nekotorymi otravleniyami. [Morphological and histochemical changes in the kidneys in acute kidney failure caused by certain intoxications.]** *Vrach. Delo 11: 72-77; 1973.* (Russian)

Morphological and histochemical changes were studied in human kidneys during lethal acute kidney failure caused by acetic acid, ethylene glycol, and dichloroethane. Acute kidney failure due to lethal poisoning by dichloroethane caused pronounced edema of the basal membranes of the vascular loops, consider-

able thickening of the parietal folium of the capsula glomeruli with pronounced desquamation of the nephrothelium, sharp reduction of the RNA and DNA levels, moderate changes in the canaliculi, and slight edema of the cortical and medullary interstitium. Protein dystrophy of the epithelium of the canaliculi was noted. Dichloroethane was the least nephrotoxic of the three toxic agents under study.

74-2950. Holm, R. E.; Szabo, S. S. (Diamond Shamrock Corp., T. R. Evans Res. Cent., P.O. Box 348, Plainsville, OH 44077). **Increased metabolism of a pyrrolidine urea herbicide in corn by a herbicide antidote.** *Weed Res. 14(2): 119-122; 1974.* (14 references)

Corn, cotton, and sorghum plants were injured by high rates of 5328 (*cis*-2,5-dimethyl-1-pyrrolidinecarboxanilide) when it was applied to the soil surface at planting time. The injury was severe at 35.84 kg/ha (eight times recommended dosage) and in corn resulted in complete inhibition of adventitious root development and reduced shoot and primary and secondary root growth. Treatment of the seeds with 0.5% Protect (1,8-naphthalic anhydride) prior to planting dramatically decreased the injurious effect of 5328 on corn, sorghum, and cotton. Using ^{14}C-5328 in corn, it was shown that Protect did not alter herbicide uptake. However, the rate of conversion of the herbicide molecule in corn tissue to water soluble, nonherbicidal metabolites was markedly enhanced in plants grown from Protect-treated seeds. (Author abstract by permission)

74-2951. Markosyan, V. Ye. (Dept. Ind. Hyg., Yerevan Med. Inst., Yerevan, USSR). **O toksichnosti 3-nitro-4-oksibenzilovogo efira 2,4-dikhlorfenoksiuksusnoy kisloty. [Toxicity of the 3-nitro-4-hydroxybenzyl ester of 2,4-dichlorophenoxyacetic acid.]** *Zh. Eksp. Klin. Med. 13: 35-37; 1973.* (Russian)

The acute oral toxicity of 2,4-dichlorophenoxyacetic acid, 3-nitro-4-hydroxybenzyl ester, was studied on albino rats and mice. Rats administered single 1.5 g/kg doses died within a few hours; rats administered smaller doses died during the first week after poisoning. The highest non-lethal dose was 0.5 g/kg; the minimum lethal and absolute lethal doses were 0.75 and 1.5 g/kg, respectively. The LD50 was 1.00 g/kg. Temporary loss of weight, anorexia, and, at autopsy, plethora of the lungs and of the gastrointestinal tract, hepatomegalia, and focal hemorrhage in the cerebrum were observed. Other tests carried out on rats and mice revealed no skin irritative and topical resorption properties of the new pesticides.

74-2952. Ungerer, O.; Eisenbrand, G.; Preussmann, R. (Inst. fuer Toxikol. und Chemotherapie, Deutsches Krebsforschungszentrum, Heidelberg, Germany). **Zur Reaktion von Nitrit mit Pestiziden. Bildung, chemische Eigenschaften und cancerogene Wirkung der *N*-Nitrosoverbindung des Herbizids *N*-methyl-*N'*-(2-benzothiazolyl)-harnstoff (Benzthiazuron). [The reaction of nitrite with pesticides. Formation, chemical properties and carcinogenic activity of the *N*-nitroso compound of the herbicide *N*-methyl-*N'*-(2-benzothiazolyl)-urea (Benzthiazuron).]** *Z. Krebsforsch. 81(3-4): 217-224; 1974.* (12 references) (German)

The nitrosation of benzthiazuron (*N*-methyl-*N'*-(2-benzothiazolyl)-urea) by nitrogen tetroxide and nitrite was studied under conditions similar to those prevailing in the stomach. The carcinogenic effect of the *N*-nitroso compound obtained was investigated on Wistar rats. The maximum yields of the *N*-nitroso products obtained with a 5-fold molar excess of nitrite at benzthiazuron concentrations of 0.001 mole and 0.0001 mole at 37°C were 11% and and 3% of the theoretical yields, respectively. The nitrosation rate was highest at pH 1. The nitrosated substance (*N*-nitrosobenzthiazuron) was found to be a potent carcinogen in male and female Wistar rats. Chronic oral doses of 50 and 25 mg/kg twice a week induced tumors of the forestomach in all animals after 400 days. Single doses of 400-800 mg/kg mainly induced tumors of the kidney.

74-2953. Tomatis, L.; Turusov, V.; Charles, R. T.; Boiocchi, M.; Gati, E. (International Agency Res. Cancer, Lyon, France). **Liver tumors in CF-1 mice exposed for limited periods to technical DDT.** *Z. Krebsforsch. 82(1): 25-35; 1974.* (11 references)

Groups of minimally inbred CF-1 mice were maintained on diets containing 250 ppm technical DDT for 15 or 30 weeks. The amounts of DDT and metabolites stored in the liver, various tumors, brain, fat, and kidneys were similar for animals maintained on the DDT diet for 15 and 30 weeks. Five lung tumors and one osteoma were found after 15 weeks of DDT treatment. Fifty weeks after the cessation of the 15-week treatment, hepatomas were observed in 5.3% of the females and 21.6% of the males. Eighty weeks after cessation of the 15-week treatment, 18% of the females and 43.4% of the males had developed hepatomas. One hundred and five weeks after cessation of the 15-week treatment, 10.2% of the females and 41.4% of the males had developed hepatomas. At the cessation of the 30-week treatment, none of the animals had developed hepatomas. Thirty weeks after cessation of the 30-week treatment 63.7% of the males and 7.7% of the females had developed hepatomas; 65 weeks after the cessation of the 30-week treatment, 70.7% of the males and 18.4% of the females had developed hepatomas; and 90 weeks after cessation of the 30-week treatment, 66.4% of the males and 18.4% of the females had developed hepatomas. More mice had hepatomas larger than 10 mm 95 and 120 weeks after the beginning of the experiment than after 65 weeks. Thus, DDT exposure results in an increased incidence of liver tumors and in a shortening of their latency period. The hepatocarcinogenicity of

DDT is dose-related and DDT-induced hepatomas continue to grow after cessation of the treatment.

74-2954. Adamec, O.; Ledec, M.; Kosutzky, J.; Bobakova, E. (Poultry Research Inst., Ivanka pri Dunaji, Czechoslovakia). **Poruchy tvorbe vajecnej skrupiny u sliepok a kacic po zatazi technickym DDT. [Disorders in the formation of eggshell in hens and ducks exposed to the effect of technical-grade DDT.]** *Zivocisna Vyroba 17(11): 835-840; 1972.* (13 references) (Czech)

The effect of ingested technical-grade DDT on eggshell formation was studied in hens and ducks. Hens were fed diet with 100 mg DDT per kg for 70 days, and ducks were fed 120 mg DDT per kg for 60 days. Following ingestion of DDT for 40 to 45 days, hen eggshells were less strong (more fragile) by 12.7%, thinner by 7.6%, and lighter by 13.6% than those in a control group. Despite continued application of DDT, the negative effect was slightly reduced by the end of the experiment. Ducks were much more sensitive to DDT: after 15 days of DDT administration, the strength of the eggshells decreased by 20.8%, the thickness by 23.8%, and the eggshell weight by 15%. Further intensification of these disorders was observed during the later stages of the experiment. In comparison with the control, the strength of the duck eggshell decreased by 32.5% and the eggshell weight by 33.2% after application of DDT for 60 to 65 days. The observed disorders in eggshell formation are due to the interference of DDT with steroid hormone processes.

74-2955. Jung, J. (Landwirtschaftliche Versuchsstation Limburgerhof/Pfalz, Badische Anilin- und Soda-Fabrik AG, Luwigshafen am Rhein, Germany). **Ueber den Einfluss des herbiziden Wirkstoffes Bentazon auf Bodenatmung und Nitrifikation in zwei Boeden. [Effect of the herbicide bentazon on soil respiration and nitrification in two types of soil.]** *Z. Pflanzenernaehr. Bodenk. 133(1-2): 18-23; 1972.* (4 references) (German)

The effect of the herbicide bentazon (active agent in Basagran) on soil respiration, measured by the carbon dioxide production, and the nitrification activity was studied in loamy sandy soils and sandy soils. Bentazon was added in the normal dose of 4 kg/ha and in increased doses of 40 and 400 kg/ha. The CO_2 production, boosted by the addition of carbon sources such as starch, cellulose, glucose, and straw, was slightly increased by bentazon doses of 4 and 40 kg/ha, while the highest dose slightly reduced the soil respiration. Doses of 4 and 40 kg/ha did not influence the nitrification process, while the highest dose slightly interfered with the nitrification process in sandy soil.

74-2956. Rueckert, W.; Ballschmiter, K. (Inst. Anorg. Chem. Anal. Chem., Johannes Gutenberg-Universitaet, Mainz, Germany). **Abbau und Toxizitaet von Hexachlorbicyclo (2.2.1)-hept-5-en-Derivaten (Cyclodien-Insektizide). [Structural aspects of biological conversion and toxicity of hexachloronorbornene derivatives (cyclodiene insecticides).]** *Z. Naturforsch. 28C(3-4): 107-112; 1973.* (26 references) (German)

The relationships between the molecular structure and the biological metabolism (hydroxylation) of 12 derivatives of endosulfan ether (4,5,6,7,8,8-hexachloro-1,3,3a,4,7,7a-hexahydro-4,7-methanoisobenzofuran) were studied on normal adult houseflies. Derivatives monosubstituted by major substituents in position 1 only were metabolized fastest, as they were readily amenable to hydroxylation in position 3. Derivatives disubstituted in positions 1 and 3 were metabolized rather slowly, since hydroxylation in these positions was sterically hindered. Metabolism was inhibited for all derivatives studied after the application of piperonyl butoxide as synergist. Some derivatives known to be metabolites of endosulfan show high intrinsic toxicity to houseflies if hydroxylation is inhibited.

See also 74-2773 74-2797 74-2802 74-2806 74-2817 74-2818 74-2819 74-2832 74-2838 74-2846 74-2850 74-2977 74-2987 74-2991

74-2957. Keszthelyi, B.; Mod, L. (Inspection Lab., Csongrad County Council Drug Center, Hungary). **Szerves foszforsaveszter-szarmazekok vekonyretegkromatografias vizsgalata. [Study of organic phosphate ester derivatives by thin-layer chromatography.]** *Acta Pharm. Hung. 43: 256-262; 1973.* (27 references) (Hungarian)

An extraction and thin-layer chromatography method was used for the qualitative and semiquantitative determination of organophosphorus pesticides; analytical data obtained for apples and peaches investigated 5 to 8 weeks after expiration of the required waiting time are presented. The fruits were crushed in a mixer and extraction done with chloroform or methylene chloride. The pesticides Flibol-E (trichlorfon), Birlane (chlorfenvinphos). Lebaycid (fenitrothion), methyl parathion, and phosphothion (malathion) were analyzed on silicagel-G layer with hexane-acetone mixture as solvent system. Visualization was possible by iodine vapor, fluorescein sodium, and chromosulfuric acid. Following treatment with 4-*p*-nitrobenzyl-pyridine, ethylenediamine in acetone proved to be a specific reagent for visualization in UV light. Analyses of peach and apple samples for methyl parathion residues 5 to 8 weeks after expiration of the waiting time revealed residue levels in excess of the maximum allowable concentration in cases when treatment had not been in compliance with the instructions.

74-2958. Abou-Donia, M. B. (Duke Univ. Med. Cent., Durham, NC 27710). **Gas chromatographic analysis of DDT-type compounds.** *Anal. Lett. 7(5): 313-325; 1974.* (27 references)

A study was made to find a liquid phase which effectively chromatographed and resolved DDT and some of its known metabolites in a novel sequence. Four columns were used experimentally in combination with an electron capture detector which allowed the determination of 25 DDT-type compounds, some of which were reported as DDT breakdown products. The liquid phases were 5% QF-1, 5% Igepal, 5% Versamid 900, and 5% DC-11. The solid support for the 4 columns was 80 to 100 mesh Chromosorb W. Optimal temperatures for the columns were: 190 (column), 210 (detector), and 230°C (injector port). Optimal nitrogen flow rate was 35 ml/min for all columns. The trimethylsilyl derivatives of the polar DDT-type compounds, DBH, DDOH, dicofol, and DDA were successfully gas chromatographed on the column 5% QF-1 and the mixed column 2.5% QF-1 + 2.5% SE-30. The low detection sensitivity of Igepal and Versamid limits their use for routine analysis, but on the sensitive columns, QF-1 and DC-11, they may be useful for confirmation of identity of some unresolved compounds.

74-2959. Onuska, F. I. (Canada Center for Inland Waters, Burlington, Ontario, Canada). **Determination of *N,N*-dialkyl dithiocarbamates in wastewater by thin-layer densitometry.** *Anal. Lett. 7(5): 327-334; 1974.* (20 references)

The quantitative determination of *N,N*-dialkyl dithiocarbamates, tetramethylthiuram disulfide (thiram), and tetramethylthiuram monosulfide in industrial wastewater was studied by thin-layer densitometry of their copper complexes. Data obtained in the study indicates that this method provides an alternative determination route if adequate separations of dithiocarbamates and thiurams in a mixture are achieved. Good peak definition and a steady base line are apparent. These characterjstics indicate that a relatively rapid procedure for the quantitative evaluation of dialkyl dithiocarbamate group compounds in a mixture by TLC and densitometry should be developable. The technique is a nondestructive quantitative method of detection and is also an excellent clean-up procedure for qualitative studies of individual spots by infrared and mass spectrometric techniques. *N,N*-dialkyl dithiocarbamates have been analyzed in microgram quantities using this method. Coefficients of variation of 2-6% were obtained.

74-2960. Thozet, H.; Lamotte, A. (Lab. de Chimie Anal. du Professeur J. C. Merlin, Univ. de Lyon I, Lyon, France). **Influence de l'adsorbant en chromatographie d'adsorption sur couches minces. Application a la chromatographie des organophosphores sur silice. [Influence of adsorbent in thin-layer adsorption chromatography. Application of the chromatography of organophosphorus compounds on silica.]** *Bull. Soc. Chim. Fr. 4 (Pt. 1): 1245-1251; 1973.* (38 references) (French)

Different silica adsorbents used in TLC determination of organophosphorus compounds were studied regarding their influence on the determination in general and on the *Rf* values in particular. The studies involved laboratory experiments with G, H, HR, and PF 254 types of Merck silica; large-pore 150, 500, and 1000 type silica; and silanized silica gels. The *Rf* values increased as the sorbent-water ratio decreased; *Rf* values decreased as the layer thickness increased in the 0.25-0.5 mm range. The chromatographic behavior (*Rf* value) of triphenylphosphate, phenyldiphenylphosphate, diphenylphenylphosphate, and triphenylphosphine oxide depended on their respective molecular structures characterized by the TAFT coefficient. The variability of standardized *Rf* values is enhanced by the strong humidity dependence of the *Rf* value, frequently resulting in non-reproducibility of the results among different laboratories and in different seasons. The relationships established between the migration of the solute and its structure, as well as the nature and structure of the solvent, remain valid for a given adsorbent (e.g. silica) regardless of its characteristics.

74-2961. Kroeller, E. (Max von Pettenkofer-Institut, Bundesgesundheitsamt, Berlin-Dahlem, Germany). **Eine**

Moeglichkeit zur Restmengenbestimmung von alpha-naphthylessigsaeure auf Aepfeln. (One possibility of determining residual quantities of alpha-naphthylacetic acid on apples.] *Deut. Lebensm. Rundsch. 70(8): 279-280; 1974.* (7 references) (German)

A rapid colorimetric method for the determination of alpha-naphthylacetic acid residues on apples is described. Following extraction with methylene chloride, the extract is purified by means of monobasic potassium carbonate, and after reextraction with methylene chloride, the dry residue dissolved in methylene chloride is cleaned up chromatographically on a silica gel layer, using chloroform and acetic acid as carrier. The fluorescent spots identified in UV light are cut out and extracted with methylene chloride. The residue is dissolved in acetic acid, combined with nitric acid, sodium nitrate, and finally with di-*n*-butylether. Following separation of the aqueous phase, sodium hydroxide is added, and the extinction of the yellow solution is measured at 375 nm in a 5 cm- cuvette.

74-2962. Kirchhoff, J. (Abteilung Phytopathol. und Pflanzenschutz, Univ. Hohenheim, Stuttgart-Hohenheim, Germany). **"Inhaltsstoffe" von Filterpapier als Ursache von Stoersignalen bei der gaschromatographischen Bestimmung von Pflanzenschutzmittelrueckstaenden mit dem Alkaliflammenionisationsdetektor. [Constituents of filter paper as sources of interference in the gas chromatographic determination of pesticide residues with the alkali flame ionization detector.]** *Deut. Lebensm. Rundsch. 70(8): 284-285; 1974.* (2 references) (German)

Tributyl phosphate and another compound, possibly an organophosphate, were detected in various filter papers generally used for cleaning up extracts for pesticide residue analysis by gas chromatography with the alkali flame ionization detector. The substances may penetrate into the test solution and accumulate during further analysis, creating difficulties in GC analysis of pesticide residues under unfavorable conditions, as in the case of atrazine. Both substances, constituents of the filter papers, have short retention times. Interferences due to these substances can be avoided by preliminary double extraction in a Soxhlet apparatus.

74-2963. Uporova, G. I.; Shtiler, S. Yu. (District Sanit. Epidemiol. Station, Smolensk, USSR). **Opredeleniye dikoteksa v vozdukhe metodom tonkosloynoy khromatografii. [Determination of dicotex in air by thin-layer chromatography.]** *Gig. Tr. Prof. Zabol. 17: 54-55; 1973.* (4 references) (Russian)

A thin-layer chromatographic method for the quantitative determination of dicotex (MCPA) in air is described. An air volume of 20-30 liters is sampled at a rate of 1 liter/min through granulated silica gel (used as adsorbent), from which dicotex is extracted with chloroform. The extract is further cleaned up with concentrated sulfuric acid. Chromatographic determination is done on an alumina layer, using glacial acetic acid as the mobile phase. Quantitative determination, at a sensitivity of 1 μg per sample, is possible by visual comparison of the coloration intensity of the spots against a reference solution.

74-2964. Khan, S. U. (Chem. and Biol. Res. Inst., Res. Branch, Canada Agr., Ottawa, Ontario, K1A OC6, Canada). **Determination of diquat and paraquat residues in soil by gas chromatography.** *J. Agr. Food Chem. 22(5): 863-869; 1974.* (11 references)

An analytical method is described for the gas chromatographic determination of diquat and paraquat residues in soil. The method involves extraction of the soil with 18 *N* H_2SO_4, followed by catalytic hydrogenation of the acid extract, and determination by gas chromatography. Recoveries of these two herbicides added to soils at 0.1 and 0.05 ppm levels were between 84 and 95%. The lower limit of sensitivity for this method is approximately 0.01 ppm. The method has been used for the determination of field applied diquat and paraquat in three different types of soil. Hydrogenation of acid extracts from organic soil required more catalyst per gram of soil than from mineral soil. The pH of the soil extract from 1 to 9 had no effect on the recovery of field applied herbicide residues. The capabilities of various columns, an alkali flame ionization detector (AFID), and a flame ionization detector (FID) have also been compared for the analyses of diquat and paraquat. (Author abstract reprinted by permission of the American Chemical Society)

74-2965. Newsome, W. H. (Food Res. Labs., Health Protect. Branch, Health and Welfare Canada, Tunney's Pasture, Ottawa, K1A OL2, Ontario, Canada). **A method for determining ethylenebis(dithiocarbamate) residues on food crops as bis(trifluoroacetamido)ethane.** *J. Agr. Food Chem. 22(5): 886-889; 1974.* (15 references)

Ethylenebis(dithiocarbamate) added to food crops was measured as ethylenediamine after hydrolysis with acid containing stannous chloride. The ethylenediamine was isolated by ion exchange chromatography and quantitated by gas–liquid chromatography of its bis(trifluoroacetate). Overall recoveries in the 0.16–1.3 ppm range were greater than 80%. Free ethylenediamine was determined after acid extraction but without prior hydrolysis. Storage of lettuce containing maneb for 4 days did not affect the yield of ethylenediamine obtained after hydrolysis. (Author abstract reprinted by permission of the American Chemical Society)

74-2966. Villanueva, E. C.; Jennings, R. W.; Burse, V. W.; Kimbrough, R. D. (Environ. Protect. Agency, Chamblee Toxicol. Lab., Chamblee, GA 30341). **Evidence of chlorodibenzo-*p*-dioxin and chlorodibenzo-**

furan in hexachlorobenzene. *J. Agr. Food Chem. 22(5): 916-917; 1974.* (16 references)

Three commercial hexachlorobenzene preparations were analyzed for toxic impurities. The impurities were separated from the hexachlorbenzene by fractional crystallization followed by alumina chromatography. The contaminants were identified by electron capture gas chromatography and by gas chromatography–mass spectrometry. The levels of the impurities were determined when the standards were available. Pentachlorobenzene was the major contaminant in all preparations. A number of other compounds were found including hepta- and octachlorodibenzofuran and octachlorodibenzo-*p*-dioxin. It is important that any studies which are conducted to evaluate the toxicity of hexachlorobenzene take these findings into consideration. (Author abstract reprinted by permission of the American Chemical Society)

74-2967. Seiber, J. N. (Dept. Environ. Toxicol., Univ. of California, Davis, CA 95616). **Reversed phase liquid chromatography of some pesticides and related compounds. Solubility retention relationships.** *J. Chromatogr. 94: 151-157; 1974.* (21 references)

The liquid chromatographic retentions of 17 pesticides have been studied on Vydac reversed-phase in water-methanol and water–ethanol mixed solvents. The logarithm of the adjusted retention relative to methoxychlor correlated linearly with Beroza partition *p*-values recorded in heptane–90% ethanol (correlation coefficients greater than 0.95). The resulting relationship could have value in the choice of eluting solvent ratio and prediction of relative retentions in the separation of mixtures, and in defining the polarity of unknowns in mixtures. Retention characteristics of some polychlorinated biphenyl mixtures are given for illustration. Relative responses of the pesticides to the 254-nm ultraviolet detector were tabulated to allow estimation of limits of detectability for individual compounds. (Author abstract by permission)

74-2968. Deshmukh, S. N.; Sidhu, T. S. (Dept. Entomol., Punjab Agr. Univ., Ludhiana, India). **Colorimetric estimation of fenitrothion residues on vegetables and fruits.** *J. Food Sci. Technol. 11(2): 81-83; 1974.* (11 references)

Fenitrothion was extracted with methyl cyanide. After filtration, partitioning was done with a 100 ml mixture of petroleum ether and diethyl ether in the presence of distilled water. After the upper layer was concentrated to 10 ml, it was passed through a Florisil column. Elution was done with 50 ml of eluting mixture. Suitable extract was taken in a small beaker and the solvent was evaporated after adding diethylene glycol as keeper. Hydrogen peroxide was added, and conditioning was done at 35°C for 15 min. Hydrolysis of the insecticide was done by adding alkali and keeping the beaker at 35°C for 20 min. Intensity of the developed yellow color was measured at 400 nμ. The method was tried for nine substrates and worked very well with eight of them. The sensitivity of the method was 0.03 ppm. When 100 ml of petroleum ether was used for partitioning of fenitrothion from acetonitrile-water phase, the recovery was low. A mixture of petroleum ether and diethyl ether increased recovery.

74-2969. Makarova, S. V.; Soboleva, D. A.; Bel'skaya, G. F.; Zaks, P. G. (All-Union Sci. Res. Inst. Chemical Plant Protection Agents, USSR). **Iodometricheskiy metod analiza ritsida. [Iodometric method for analyzing ricide (*O,O*-diethyl *S*-benzyl thiophosphate).]** *Khim. Sel. Khoz. 11(3): 206-207; 1973.* (Russian)

An iodometric method for the quantitative determination of ricide (*O,O*-diethyl-*S*-benzylthiophosphate, kitazin) and ricide P (*O,O*-dipropyl-*S*-benzylthiophosphate, kitazin P) in technical preparations and emulsions is presented. The samples to be analyzed are treated with 2*N* solution of potassium hydroxide in ethanol for quantitative hydrolysis which takes 2 min in the case of ricide and about 30 in the case of ricide P. The thiobenzyl alcohol formed during hydrolysis is subsequently determined iodometrically after acidification with acetic acid and addition of starch.

74-2970. Novikova, K. F.; Mel'tser, F. R. (All-Union Sci. Res. Inst. Chemical Plant Protection Agents, USSR). **Kolorimetricheskiy metod opredeleniya mikrokolichestv DDVF v moloke i vode. [Colorimetric determination of trace amounts of DDVP in milk and water.]** *Khim. Sel. Khoz. 11(8): 607-609; 1973.* (4 references) (Russian)

A colorimetric method for the quantitative determination of DDVP (dichlorvos) in milk and water is described. The DDVP residue is extracted from water by means of methylene chloride. Milk samples to be analyzed are first coagulated with acetone and then extracted with petroleum ether. The condensation product of dichloroacetaldehyde, obtained by alkaline hydrolysis with resorcinol, is determined spectrophotometrically at 487 nm. The sensitivity of the method is 0.1 mg/liter in milk and 0.04 mg/liter in water. The rates of DDVP recovery from milk and water are 83.6±9.5% and 87.6±3.8%, respectively.

74-2971. Supin, G. S.; Klisenko, M. A.; Bekshteyn, M. Sh. (All-Union Sci. Res. Inst. Chemical Plant Protection Agents, USSR). **Polyarograficheskoye opredeleniye ostatochnykh kolichestv fungitsidov–proizvodnykh ditiokarbaminovykh kislot. [Polarographic determination of residual amounts of dithiocarbamate-derived fungicides.]** *Khim. Sel. Khoz. 11(11): 840-842; 1973.* (8 references) (Russian)

A polarographic method for the quantitative determination of zineb, polymarzine, polycarbazine, ferbam,

ziram, and ethylenethiuramdisulfide in biological materials (potato, apple, meat) is described. The pesticide residues are extracted from potatoes and apples by means of a background solution (aqueous solution of sodium hydroxide with 0.05 *M* sodium acetate) which is also used as a polarographic background. Sodium sulfite is added to the extract which is then bubbled with inert gas. The residues are extracted from tissue samples by means of the same background solution without additional washing. The polarograms are evaluated against calibration curves obtained with standard solutions and the background solution. The rates of recovery range from 70 to 80%, and the sensitivity of the method is 80 μg/ml.

74-2972. Knyr, L. L.; Sokolov, M. S. (Inst. Agrochem. and Soil Science, Acad. Sci. USSR, USSR). **Sposoby kratkovremennoy konservatsii prob pochvy i vody, soderzhashchikh galoidfenoksikisloty i ikh toksichnyye metabolity. [Short-term preservation of soil and water samples containing halophenoxyacetic acids and their toxic metabolites.]** *Khim. Sel. Khoz. 12(3): 58-60; 1974.* (2 references) (Russian)

Methods for the short-term preservation of soil and water samples containing 2,4-D, 2M-4C (MCPA), 2,4-dichlorophenol, and *p*-chloro-*o*-cresol and their toxic metabolites were developed. Soil samples with these pesticides are best preserved in aqueous solutions of sodium chloride and sodium hydroxide. Drying the soil samples would result in residue losses amounting to 60-70%. Water samples containing 2,4-D and 2,4-dichlorophenol are best preserved in toluene or beta-propiolactone at pH values of 1-3 and 11, respectively.

74-2973. Popova, N. G.; Kashimov, U. S.; Pulatov, U. F. (Uzbek Sci. Res. Inst. Sanit., Hyg. and Occupational Diseases, USSR). **Kolorimetricheskiy metod opredeleniya treflana v ovoshche-bakhchevykh kul'turakh i pochve. [Colorimetric determination of trifluralin in vegetable and melon cultures and in soil.]** *Khim. Sel. Khoz. 12(4): 66; 1974.* (2 references) (Russian)

A colorimetric method is described for the quantitative determination of trifluralin residues in vegetables, melons, and in soil samples. Following extraction with *n*-hexane, the extracts are cleaned up and evaporated, after which the dry residue is combined with ethanol and 10% solution of sodium hydroxide for subsequent colorimetric determination in a 5 mm cuvette with blue filter. Evaluation is done against a calibration curve, but visual comparison is also possible.

74-2974. Balinova, A. (Inst. Plant. Protection, Kostinbrod, Bulgaria). **Opredeleniye ostatochnykh kolichestv dimida i yego metabolitov v rastitel'nom materiale metodom gazozhidkostnoy khromatografii. [GLC determination of residual amounts of dimide and metabolites in plant materials.]** *Khim. Sel. Khoz. 12(5): 62-65; 1974.* (6 references) (Russian)

A gas-liquid chromatographic method is described for the quantitative determination of dimide (*N,N*-dimethyl-2,2-diphenylacetamide, EPN) and its two metabolites (*N*-methyl-2,2-diphenyl acetamide and diphenylacetamide) in plant materials. Following extraction with benzene and separation between hexane and acetonitrile phases, clean-up is done on silica gel, using a 9.5:0.5 ratio of benzene and glacial acetic acid as mobile phase. The spots appearing under UV light are eluted with chloroform for subsequent gas-chromatographic determination of the three different compounds by means of a flame-ionization detector. The retention times of dimide, *N*-methyl-2,2-diphenyl acetamide, and diphenylacetamide were 13 min, 18 min, and 23 min. The sensitivity of the method is 0.02 mg/kg for dimide, 0.03 mg/kg for *N*-methyl-2,2-diphenylacetamide, and 0.05 mg/kg for diphenylacetamide.

74-2975. Solov'eva, Ye. I.; Berlyant, O. R.; Tsikerman, I. B. (Ukrainian Sci. Res. Inst. Canning Industry, USSR). **Opredeleniye soderzhaniya metationa v plodovom syr'e a konservakh. [Determination of metathion levels in raw and canned fruit.]** *Konserv. Ovoshchesuch. Prom. 8: 34-35; 1973.* (Russian)

A thin-layer chromatographic method for the quantitative determination of metathion in raw and canned fruits is described. Following extraction with chloroform for 30 min, the extract is purified by means of 2% aqueous solution of ammonium chloride in methanol. The cleaned-up extract is applied on an alumina-gypsum layer, using a 4:1 ratio of *n*-hexane and acetone as solvent system, and 4 *N*-solution of sodium hydroxide as visualizing reagent. The rate of metathion recovery is 75%.

74-2976. Biros, F. J. (Primate & Pesticides Effects Lab., Environ. Protect. Ag., Perrine, FL 33157). **Mass spectrometry in the study of pesticides: an introduction.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 3-4.* (2 references)

Mass spectrometry has been used increasingly in recent years for characterizing pesticides of unknown structure. Mass spectrometry is routinely used in studying the environmental degradation of pesticides; for qualitative and quantitative monitoring of residues in human, animal, and environmental media; in pesticide mechanism-of-action studies; for supporting other analytical techniques such as gas-liquid chromatography, liquid chromatography, and thin layer chromatography; and in characterizing insect and mammalian metabolites in biochemical studies. The low cost of mass spectrometry, its high reliability, and the applicability of computers in processing mass spectral data are significant factors in the rapidly increasing use of this analytical tool.

74-2977. McKinney, J. D.; Oswald, E. O.; DePaul Palaszek, S. M.; Corbett, B. J. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Characterization of chlorinated hydrocarbon pesticide metabolites of the DDT and polycyclodiene types by electron impact and chemical ionization mass spectrometry.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 5-32.* (25 references)

The electron impact and chemical ionization mass spectra for essentially all known metabolites and a few of the proposed metabolites, and some derivatives of the chlorinated hydrocarbon pesticides DDT, dieldrin, and aldrin (and their isomers) were examined. The electron impact and chemical ionization spectra of these systems are in most cases qualitatively and quantitatively different. Thus, chemical ionization mass spectrometry adds a new dimension to MS identification and characterization. The appreciable quantity of chemical information derived from both the electron impact and chemical ionization spectra proved valuable in studying the metabolism and other degradative processes such as photolysis and thermolysis, of these compounds. Stereochemical information was also derived. This study clearly demonstrated the advantages of combined electron impact and chemical ionization mass spectrometry in differentiating closely related systems. With this combination it should be possible to confidently identify amounts in the low nanogram or even the picogram range.

74-2978. Dougherty, R. C.; Roberts, J. D.; Tannenbaum, H. P.; Biros, F. J. (Dept. Chem., Florida State Univ., Tallahassee. FL 31306). **Positive and negative chemical ionization mass spectra of polychlorinated pesticides.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 33-47.* (8 references)

The chemical ionization (CI) and negative chemical ionization (NCI) mass spectra of polychlorinated pesticides are generally simple, intense, and easy to interpret. The two types of spectra show different patterns for the same molecules. The CI spectra of polycyclic pesticides are usually dominated by $(M\text{-}Cl)^+$ ions while their NCI spectra are dominated by $(M+Cl)^-$ ions. The same is true for aromatic DDT type pesticides. The CI spectra of DDT derivatives and other olefinic relatives show intense MH^+ or $M^{+\cdot}$ ions while their NCI spectra usually have $(M+Cl)^-$ as the base peak. Polychlorinated biphenyl compounds produce MH^+ ions exclusively under CI conditions. The NCI spectra are dominated by $(M\text{-}19)^-$ anions. The CI and NCI spectra of partially purified tissue extracts have clearly shown that these methods have sufficient sensitivity for direct application in screening sample extracts for pesticide residues at ppm levels. It is suggested that, judging from the intensity of the spectra obtained in the samples studied, it should be possible to detect specific residues at the ppb or ppt levels.

74-2979. McLafferty, F. W.; Busch, M. A.; Kwok, K. S.; Meyer, B. A.; Pesyna, G.; Platt, R. C.; Sakai, I.; Serum, J. W.; Tatematsu, A.; Venkataraghavan, R.; Werth, R. G. (Dept. Chem. Cornell Univ., Ithaca, NY 14850). **A self-training interpretive and retrieval system for mass spectra.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 49-60.* (4 references)

A self-training interpretive and retrieval system for computer interpretation of mass spectra which directly utilizes data from all available reference spectra and does not require prior spectrum/structure correlations of these data by either human or computer effort has been developed. The computer selects different classes of data known to have high structural significance, such as characteristic ions, series of ions, and masses of neutrals lost, from the unknown mass spectrum and matches these against the corresponding data of all the reference spectra. The reference compounds of closest match in each data class are examined for common structural features; criteria have been determined so that such features can be identified with approximately 95% reliability. Each reference compound has been coded in Wiswesser Line Notation to further utilize computer recognition of structural features. The data base for this system contains a file of 25,000 reference mass spectra which represent approximately 18,000 different compounds. A description of the method employed for checking the quality of the data is provided. The FORTRAN program presently in use requires approximately 12 minutes per unknown spectrum.

74-2980. Safe, S.; Jamieson, W. D.; Hutzinger, O. (Atlantic Regional Lab., Nat. Res. Council, Halifax, Nova Scotia, Canada). **Ion kinetic energy spectroscopy: a new mass spectrometric method for the unambiguous identification of isomeric chlorophenols.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 61-70.* (8 references)

Ion kinetic energy (IKE) spectroscopy records the ionic decompositions which occur in the first field-free region of the mass spectrometer prior to the electric sector. These ions can be recorded by suitable defocussing techniques. When the electric sector voltage is scanned from 0 to 100% energy the daughter ions pass through the slit and can be detected and recorded. IKE spectra have readily distinguished between isomeric DDTs, polychlorinated biphenyls, chlorobenzenes, and hexachlorocyclohexanes. In this paper the IKE spectra of monochlorophenols (all three isomers), the six isomers of dichlorophenol, and the five isomers of trichlorophenol are presented. The results of the study clearly indicate that the IKE method is useful for distinguishing between isomeric chlorophenols and is thus a further aid in the identification of these compounds.

74-2981. Curley, A.; Jennings, R. W.; Burse, V. W.; Villanueva, E. C. (Environ. Protect. Ag., Chamblee

Toxicol. Lab., Chamblee, GA 30341). **Electron impact spectra of several aromatic systems.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 71-80.* (5 references)

During an investigation of pesticides and related compounds for contaminants, evidence of ortho-para substituent effects in aryl systems was observed in the mass spectrometric fragmentation patterns. Compounds examined were phenyl ether, octachlorodiphenyl ether, 2,7-dichlorodibenzo-*p*-dioxin, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, octachlorodibenzofuran, octachlorodibenzo-*p*-dioxin, and dibenzofuran. The tendency toward modulation of the skeletal fragmentation patterns was quite evident in these compounds. A surprising loss of water noted in the dibenzofuran is definitely modified by the presence of chlorine in the molecule. Gross differences in the fragmentation of the diphenyl ether and the chlorinated diphenyl ether indicate that the presence of chlorine in the aromatic ring system greatly alters the tendency of some skeletons of molecules to fragment along the paths followed by the skeletons of their unsubstituted counterparts.

74-2982. Alley, E. G.; Layton, B. R, (Mississippi State Chem. Lab., MS). **Identification of insecticide photoproducts by mass spectrometry.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 81-90.* (3 references)

Photoproducts of the insecticide mirex have been studied by mass spectrometry. Irradiation of the chlorocarbon in hydrocarbon solvents with UV light produced $C_{10}Cl_{11}H$ and $C_{10}Cl_{10}H_2$ derivatives. Three isomeric structures are possible. The structures of the photoproducts of similar pentacyclic compounds were investigated to obtain more information concerning the photochemistry of mirex. Kepone hydrate and the dimethyl ketal of kepone (chlordecone) were structurally analyzed on the basis of their mass spectra. The structure of the $C_{10}C_{11}H$ photoproduct was assigned because chemical conversion of the primary photoproducts of kepone derivatives to their corresponding mirex analogues produced compounds identical to the mirex photoproducts. Two possible structures for the $C_{10}Cl_{10}H_2$ photoproduct were also obtained from mass spectrometry data.

74-2983. Rosen, J. D.; Pareles, S. R. (Dept. Food Sci., Rutgers Univ., New Brunswick, NJ 08903). **Mass fragmentography as applied to some organophosphate insecticides.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 91-98.* (12 references)

In a mass spectrum of diazinon, the most abundant ion was m/e 137; therefore, the mass marker was set on 137 and the peak was optimized with the accelerating voltage. After the 137 peak was optimized and the diazinon used to optimize the peak was pumped away, an 8.7% relative standard deviation for 5 successive 2 ng on-column injections was obtained. No impairment to quantitation at this level was observed even when 2 ng of diazinon were injected in a solution containing 5 micrograms spinach extract. No clean-up of the spinach was conducted. Diazinon is not an ideal compound for mass fragmentography because upon fragmentation no single ion is produced in much greater yield than a number of others. Since the sensitivity of the mass fragmentography technique depends on the detection of the single ion, the sensitivity is reduced. It is suggested that combining mass fragmentography with chemical ionization may be helpful. Other organophosphate insecticides studied were sumithion (fenitrothion), malathion, and DDVP (dichlorvos). All gave satisfactory calibration curves down to 4, 8, and 24 ng respectively.

74-2984. Plimmer, J. R.; Klingebiel, U. I. (Agr. Environ. Quality Inst., Agr. Res. Center-West, USDA, Beltsville, MD). **The application of mass spectrometry to the study of nitroaniline-derived herbicides.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 99-112.* (27 references)

In view of their acceptance as herbicides, it is important to elucidate the pathways by which dinitroanilines are metabolized or altered in the environment. The fragmentation pathways of dinitroaniline herbicides and their photoproducts and metabolites were studied and compared with model compounds. Compounds studied included: 2,4-dinitrobenzene, 2,6-dinitrotoluene, *ortho*-hydroxyacetanilide, 2,6-dinitroaniline, 4-*tert*-butyl-2,6-dinitroaniline, 4-*tert*-butyl-2-nitro-6-nitrosoaniline, trifluralin, *N,N*-bis(2-chloroethyl)-2,6-dinitro-*p*-toluidine, *N*-alkyl-2,6-dinitroaniline, 2-methylbenzimidazole, benzimidazole, 2-methylbenzoxazole, and benzoxazole. The formation of stable ions can most frequently be accounted for by the location of a positive charge on the nitrogen atom. In addition, the formation of an abundant molecular ion is a useful distinguishing feature of some benzimidazole derivatives. Although the spectra are generally complex, high resolution measurements permit rapid identification of several common fragmentation pathways.

74-2985. Biros, F. J.; Ryan, J. F., III. (Primate & Pesticides Effects Lab., Environ. Protect. Ag., P.O. Box 490, Perrine, FL 33157). **Determination of metastable transitions in the mass spectra of pesticides by direct analysis of daughter ions.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 113-134.* (19 references)

Consideration of parent-product ion relationships resulting from metastable studies is extremely valuable if the structure of the molecule must be reconstructed from the fragments. A metastable peak relating two peaks in the fragmentation spectrum indicates that these

two peaks arise from one and the same substance. Further, the smaller mass fragment of the pair must of necessity be composed entirely of atoms present in the larger mass fragment, from which it was produced by a unimolecular reaction mechanism generally involving simple bond fission or electron transfer. The pesticides included in this study were abate, barban, benomyl, dicapthon, and diphenamid. The direct analysis of daughter ions provides an extremely valuable adjunct to the study of fragmentation mechanisms in the electron impact induced mass spectra of pesticidal compounds. This approach should be useful in correlating mass spectral behavior and molecular structure of pesticide metabolites and degradation products of unknown structure.

74-2986. Haque, R. (Dept. Agr. Chem., Oregon State Univ., Corvallis, OR 97331). **NMR Studies of pesticides: an introduction.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 137-138.* (2 references)

Nuclear magnetic resonance spectroscopy has been used more extensively in recent years in solving pesticide problems. Although the technique is less sensitive than gas chromatography and mass spectrometry, it has the advantages of versatility and ease of spectra interpretation. NMR has successfully been used in studying photochemical reactions of pesticides, determining the structure of pesticides, and monitoring the interaction of pesticides with biological polymers and surfaces. Further use of NMR techniques, the Fourier transform method, ^{13}C, and other nuclear resonance and relaxation processes may be useful in studying the behavior of toxicants in the environment.

74-2987. McKinney, J. D.; Wilson, N. K. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **NMR characterization of some chlorinated hydrocarbon pesticides, their metabolites, derivatives, and complexes.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 139-160.* (31 references)

PMR spectroscopy has been used to assess the stereochemistry of various chlorinated hydrocarbon pesticide metabolites of the DDT and polycyclodiene type. Almost all available techniques have been applied to this problem, including spin decoupling, selective lanthanide shift reagents, and the Fourier transform system. Achiral and chiral shift reagents were particularly helpful in determining stereoselective and stereospecific chemical and biological transformations of the chlorinated polycyclodiene compounds. Chemical shift measurements of the benzhydryl and aromatic proton resonances of various compounds related to DDT (isomers, metabolites, and derivatives) provided diagnostic stereoelectronic information. Earlier work has shown that DDT can undergo two types of complexation, one involving the benzhydryl proton and trichloromethyl grouping with polar complexing agents, and the other interaction of the DDT aromatic π-electron system with the π-electrons of a complexing molecule. An attempt was therefore made to classify according to binding type some of the DDT compounds studied in terms of the experimental patterns in the PMR data. Sufficient data was not available to allow meaningful correlation between binding propensities and toxicity data.

74-2988. Mackenzie, K.; Adams, C. H. M.; Cawley, D. J. (Sch. Chem., Univ. Bristol, England). **H-NMR spectra and structure of a unique tetrachloropentacyclododecanone derived from monodechloroaldrin and monodechloroisodrin.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 161-177.* (8 references)

The hexachlorocyclodiene pesticides aldrin, isodrin, dieldrin, and endrin can be stereo-selectively monodehalogenated at the dichloromethylene bridge. The dienes thus formed react as expected with acetic-sulfuric acid mixtures, dechloroaldrin giving almost entirely unrearranged acetate and about 1% of a tetrachlorocarbonyl compound, while dichloroisodrin gives predominantly a half-cage acetate. The propensity of isodrin and endrin to give half-cage compounds related to the one formed here is well known. However, aldrin is relatively inert to skeletal rearrangements. The behavior of carbo-cations derived from these halogenated structures thus contrasts with that of the analogous stereoisomeric hydrocarbon ions derived solvolytically, which undergo multiple skeletal rearrangements to give a variety of common products. It was of considerable interest, therefore, when the pentachlorodienes were found to hydrolyze in concentrated sulfuric acid to give the same initial tetrachloroketones resulting formally from protonation, ring closure, hydration, and loss of HCl. Other compounds were also formed. It is suggested that these reactions may be of interest in connection with other complex halogenated ring systems.

74-2989. Rummens, F. H. A. (Dept. Chem., Univ. Saskatchewan, Regina, Canada). **Proton Fourier transform NMR as a trace analysis tool: optimization of signal-to-noise.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 219-237.* (4 references)

An experimental study was made of all the factors which influence the Signal-to-Noise ratio in FT-NMR using 2,4-D as the test sample. In particular, the achievable Signal-to-Noise per time unit is discussed. A detection limit of 1 ppm (1 μg) or a reasonable spectrum at 10 ppm (10 μg) is achievable in 1 hr of experimentation. A further improvement by a factor of 10 in detection limit appears feasible, at the sacrifice of very long experimentation time, but the major obstacle is provided by

proton-carrying solvent impurities. In practical applications the same problem causes a need for highly specific extraction and clean-up procedures. A general description of the Puls Fourier Transform technique is given, and a general method for optimizing towards maximum Signal-to-Noise per time unit is evolved.

74-2990. Haque, R.; Tinsley, I. J. (Dept. Agr. Chem., Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR 97331). **Nuclear magnetic resonance studies of the behavior of DDT in model membranes.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 239-261.* (17 references)

Nuclear magnetic resonance techniques were used to explore the structural and thermodynamic aspects of DDT interaction with complex lipids. Studies were performed in both non-aqueous systems and aqueous dispersions of phospholipids. Several conclusions were drawn. DDT-type compounds will bind to lecithin in CCl_4 solution. Thermodynamic parameters as well as structural aspects of the binding process were revealed by PMR. The PMR spectra of DDT–type compounds can be observed when these compounds are dispersed in liposome systems. Comparisons can be made between the binding characteristics of these compounds and the biological response they produce. In particular, the distinct toxicological differences between *p,p'*-DDT and DDT derivatives correspond to pronounced differences in the way these two compounds behave in the phospholipid system studied. Investigations of the PMR spectra of DDT in liposomes can provide information on the configuration of the phospholipid in the liposome. PMR spectroscopy can provide information which will contribute to the understanding of the molecular basis of the mode of action of DDT-type compounds.

74-2991. Ross, R. T.; Biros, F. J. (EPA, Primate and Pesticides Effects Lab., Perrine, FL 33157). **A study of intermolecular complexes of bis(*p*-chlorophenyl)acetic acid and some biologically significant compounds.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 263-272.* (18 references)

The use of high resolution NMR relaxation measurement studies have provided some insight into the importance of molecular binding of *p,p'*-DDT metabolites with bovine serum albumin and human serum albumin. The binding phenomena may be interpreted in terms of preferential stabilization of the aromatic rings by binding sites on the albumin molecules. This was demonstrated by the greater relaxation rates found for the aromatic protons of the DDT metabolite than those of the α-methine proton. These relaxation rates were quite pD dependent as would be expected from a specific binding mechanism. The binding of DDT metabolites to bovine or human serum albumin is hydrophobic in nature since a direct relation was found with ionic strength and relaxation times. The relaxation rates of both complexes increase with decrease in temperature.

74-2992. Resing, H. A. (Surface Chem. Br., Naval Res. Lab., Washington, DC). **NMR of adsorbed molecules with a view toward pesticide chemistry.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry. Plenum Press, New York, 1974, p. 273-277.* (16 references)

NMR line widths, shapes, relaxation times, and chemical shifts tell about the kinetics of chemical reactions, rates of molecular rotation and diffusion, the chemical environments of nuclei, and the orientation of molecules in space. The application of NMR to surface chemistry is considered in a study of the mobility of interfacial water and in studying the mobility and chemical shift anisotropy of a model pesticide, adsorbed benzene. For the most part the role of NMR relaxation studies of molecular motion in pesticide chemistry will be to provide background knowledge of the motional properties of adsorbed molecules. This is mainly due to the fact that successful interpretation of the data requires simple systems. Solid state high resolution techniques, however, especially those involving ^{13}C, offer promise of revealing the details of pesticide-substrate interactions.

74-2993. Woessner, D. E. (Mobil Res. Devel. Corp., Dallas, TX 75221). **NMR studies of preferentially oriented water at interfaces.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesticide Chemistry, Plenum Press, New York, 1974, p. 279-304.* (30 references)

This paper reports doublet splittings which have been measured for a number of different clay-water systems in order to investigate the effects of substrate characteristics on these molecular interactions. The results indicate that the structural characteristics of interfacial water may be attributed to two influences: molecular interactions with the substrate and interactions between water molecules. The similarity of the NMR doublet splitting constants suggests that the latter influence is generally predominant. Thus the main effect of a substrate may be to provide a relatively stationary boundary for the water molecules. Since water molecules can be arranged in many different ways, the boundary allows the water molecules to interact anistropically and assume an interfacial structure which has some characteristics that are insensitive to substrate properties.

74-2994. Klopfenstein, C. E.; Koskinen, J. (Dept. Chem., Univ. Oregon, Eugene, OR 97403). **Infrared emission for detection and identification of pesticides.** *IN: Mass Spectrometry and NMR Spectroscopy in Pesti-*

cide Chemistry. Plenum Press, New York, 1974, p. 325-332.

This paper describes the use of infrared emission from heated thin films of various samples to provide information essentially equivalent to that available from infrared absorbance spectroscopy. The emission technique gave sensitivities approaching those in absorbance techniques, with the advantage that opaque solids could be examined. Samples of diazinon and phaltan (folpet) were studied by this method. It was concluded that infrared emission spectroscopy could be a powerful tool for identification of pesticides. Cooled detectors for infrared detection are becoming more readily available, and telescopic interferometers with large light gathering capabilities could be constructed. The combination would increase sensitivity over the instrument used in these studies by 1000 fold, which means that remote sensing might be possible.

74-2995. Kanazawa, J.; Masuda, T. (Nat. Inst. Agr. Sci., Tokyo, Japan). **Analytical methods for pesticide residues in soil and crops. Part 2.** *Nippon Dojo Hiryogaku Zasshi (J. Sci. Soil Anim. Fert. Jap.) 44(9): 342-354; 1973.* (55 references) (Japanese)

Analytical methods for pesticide residues in soil and crops are extensively reviewed based on 55 references. Paper and thin layer chromatography, gas chromatography, spectrophotometry, fluorescence spectrophotometry, infrared spectrometry, atomic absorption spectrophotometry, and polarography are reviewed. For paper and thin layer chromatography the adsorbents, development solvents, catalysts, color reagents, organochlorine color reagents, and carbamate color reagents are described. For gas chromatography the apparatus, column, carriers, fixed liquid phase selection, pretreatment of the test material, and detectors such as electron capture detector, microcoulometric detector, and flame photometric detector are described. Quantitation by absolute calibration and the internal standard method, and the retention times and detection sensitivity of pesticides are discussed. In the case of spectrophotometry, the Schechter-Hornstein method (BHCO), nitration method (DDT), diazonium salt (carbaryl), esterase inhibition method (organophosphates, carbamates), carbon disulfide (dithiocarbamates), and 4-aminoantipyrine (PCP, 2,4-D) tests are described.

74-2996. Kanazawa, J.; Masuda, T.; Ueji, M. (Nat. Inst. Agr. Sci., Tokyo, Japan). **[Analytical methods of pesticide residues in soil and crops. Part. 3.]** *Nippon Dojo-Hiryogaku Zasshi (J. Sci. Soil Anim. Fert. Jap.) 44(10): 385-394; 1973.* (30 references) (Japanese)

Methods of extraction, purification, quantitation, and gas chromatograph operation are described with reference to organophosphate pesticides such as EPN, fenitrothion, fenthion, malathion, diazinon, disyston (disulfoton), Ekatin TD (thiometon), dimethoate, PAP, Elsan (Papthion, phenthoate), DEP (falone), dipterex (trichlorfon), dichlorvos, and IBP (kitazin). Extraction and cleanup methods, calibration, gas chromatography, quantitation techniques, and retention time and sensitivity of carbamate determination using N-TFA derivatives are described. Carbamates extracted from produce and soil can also be determined as the monochloroacetyl, trichloroacetyl, or DNP amine derivatives.

74-2997. Numata, T.; Takahashi, M.; Takano, J. (Biochem. Lab., Nissan Chem. Ind. Co., Ltd., Shiraoka, Saitama, Japan). **[Residue analysis of ethephon.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 49-50; 1974.* (Japanese)

Methods for determining residues of ethephon, 2-chloroethylphosphonic acid, in plants and soils were studied. Ethephon is registered as a plant growth regulating agent and releases ethylene in plants to which it is applied. Citric acid was added to plant specimens before grinding to stabilize ethephon; the ground specimen was freeze-dried and the dried specimen was extracted with methanol. The extract was condensed, then methylated with diazomethane, and methylated ethephon was determined by GLC with FPD. The recovery rates of ethephon from fruits and vegetables were respectively 78-100 and 80-85%. The residues of ethephon in cucumber were below 0.02 ppm at 31 days after application and in pear, 0.03 ppm after 20 days. Ethephon was adsorbed by soil, and its decomposition was accelerated in soil. After adding citric acid to soil specimens in order to stabilize ethephon in the soil, the half-life of ethephon in soil was determined as 3-5 hr. It was presumed that the initial decomposition of ethephon in soil was not accompanied by generation of ethylene. (Lecture presented at XVII meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan).

74-2998. Takahashi, M.; Numata, T.; Takano, J. (Biochem. Lab., Nissan Chem. Ind. Co., Ltd., Shiraoka, Saitama, Japan). **[Residue analysis of MCPB and its metabolite, MCPA, utilizing nitration.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 51-53; 1974.* (3 references) (Japanese)

The utilization of derivatization reactions such as nitration, bromination, and iodination of MCPB and its metabolite, MCPA, was studied for residue analysis of MCPB in rice and soil to improve the sensitivity for ECD in GLC. After finding that nitration was best suited because of its completeness of reaction, higher sensitivity and promising recovery from soil, nitration was adopted and applied to the substances on TLC after extracting the residue in rice and soil. The recovery of MCPB and MCPA by the adopted method was 96-104 and 75%, respectively. The half-life of MCPB in a model experiment using soil was less than 10 days and three days, respectively, under flooded and normal soil conditions. MCPA was scarcely detected in paddy field soil

under reducing conditions, but the amount of MCPA under oxidizing conditions was a maximum of 0.52 ppm when the initial amount of MCPB was 2 ppm. The contents of MCPB and MCPA in brown rice grain and rice straw were below the detection limit of the method. TLC was used for removing substances which interfered with nitration. (Lecture presented at XVII meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan).

74-2999. Tamagawa, S.; Kuribayashi, H.; Ishikawa, T.; Takagi, E. (Agr. Materials Lab., Mitsui-Toatsu Kagaku Co., Ltd., Kanagawa, Japan). **[Studies on residue analysis of CNP (2,4,6-trichlorophenyl 4-nitrophenyl ether).]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 54-55; 1974.* (1 reference) (Japanese)

Methods of determining CNP (active ingredient of a herbicide, MO) and its metabolites such as amino- and azo-derivatives in brown rice and soil were established, and the fate of CNP in soil as well as its absorption and translocation to rice plant were examined. Determination of CNP and its metabolites was based on extracting the crop with acetonitrile, transferring to *n*-hexane, shaking with hydrochloric acid to separate the amino-derivative from CNP plus the azo-derivative, then column-chromatographing to separate CNP and the azo-derivative, and detecting the components by ECD-GC. From model experiments using 9% CNP granules and 9% amino-derivative, it was found that the decomposition of CNP and its metabolite, the amino derivative, was relatively rapid in soil; the amino derivative disappeared within three months after the application of CNP. The levels of CNP and its metabolites in brown rice and soil, where 3 Kg/10 a of 9% CNP, 9% amino-derivative and 1% azo-derivative was respectively applied, were below the detection limit of the method, and absorption and translocation in rice plant from the soil were not apparent. (Lecture at XVII Meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan).

74-3000. Daikyu, Y.; Uenishi, H.; Hagi, I. (Central Lab., Ishihara Sangyo Co., Ltd., Kosatsu, Shiga, Japan). **[Method of determining the residues of 4-chlorophenoxyacetic acid in vegetable crops and soil.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 56-57; 1974.* (Japanese)

To improve the sensitivity of GLC-ECD, methods of preparing more readily detected derivatives of 4-chlorophenoxyacetic acid (4-CPA) were studied. Of the five methods tested, decomposition-bromination-acetylation; methylation; chloroethyl esterification; bromination-methylation; and methyl esterification/-ethyl esterification-bromination, the last mentioned method was found to be most suitable. The minimum amount of 4-chlorophenoxyacetic acid detectable by the method was 0.03 ng; the detection limit was 0.003 ppm in crops and 0.01 ppm in soil. The recovery from crops fortified with 0.1 ppm and from soil fortified with 0.4 ppm was over 80%. The residues in treated crops such as tomato and prince melon were less than the detection limit. The half-life in soil of 4-chlorophenoxyacetic acid was nearly three days. (Lecture at XVII Meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan).

74-3001. Kamiyama, I.; Takase, I. (Pestic. Lab., Nihon Tokushu-Noyaku Seizo Co., Ltd., Hino, Tokyo, Japan). **[Studies on microanalysis by gas chromatography, Part 7. Analysis of nitrogen-containing pesticides by FID with alkali-metal salts.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 58-59; 1974.* (Japanese)

A perforated plate (18 mm O.D. and 2.3 mm thick) made of salts of alkali metals (chlorides, bromides, and sulfates of potassium, rubidium, and cesium) was positioned around the hydrogen nozzle in GLC with ECD. Its characteristics as an alkali-flame ionization detector were studied during analysis of 23 kinds of nitrogen-containing pesticides. The best results were obtained with a plate made of rubidium sulfate plus potassium chloride (9:1), hydrogen pressure of 0.60 ± 0.02 kg/cm^2, air pressure of 1.3 Kg/cm^2, carrier gas (He) at 0.8 kg/cm^2 and 340°C, and a column packed with 10% DC-200 (1 m long). The detection minimum of almost all the pesticides was less than 1 ng. The correlation coefficient between the nitrogen content of the pesticide and the relative sensitivity (control: chinomethionate) was 0.919 (column packed with 10% DC-200) and 0.862 (column packed with 5% OV-1). (Lecture at XVII meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan).

74-3002. Aizawa, T.; Kamiyama, I.; Sawafuji, S.; Takase, I. (Pestic. Lab., Nippon Tokushu Noyaku Seizo Co., Ltd., Hino, Tokyo, Japan). **[Studies on microanalysis by gas chromatography, Part 8. Residue analysis of carbamate pesticides by AFID.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 60-61; 1974.* (Japanese)

After hydrolyzing several carbamate pesticides with alkali or acid and reacting the amines formed by hydrolysis with 1-fluoro-2,4-dinitrobenzene (DNFB), 4-chloro-α-trichloro-3-nitrotoluene (MNT), or 4-chloro-α-trichloro-3,5-dinitrotoluene (DNT), the amine derivatives were examined by gas chromatography as to their retention times and sensitivity. Although the minimum detectable amounts of the latter two derivatives were 0.1 ng and their sensitivities were three times as great as those of the first derivative, their retention times were too small. A method of extracting the specimen with acetone, hydrolyzing the extract at pH 10, reacting the hydrolyzate with DNFB, then determining the reaction product by GC-AFID (gas chromatography with alkali flame ionization detection) was established. Recovery from crops and soils fortified with *N*-methylcarbamate was greater than 80% (brown rice grain and straw) and greater than 90% (soil) respectively at 0.1-0.5 ppm. It was possible to detect down to 0.005 ppm. The packing material for the GC-column was DC-200. Examples were

described in which the pesticide used was propoxur or carbofuran. The AFID utilized a perforated plate made of a mixture of rubidium sulfate and potassium chloride (9:1). (Lecture at XVII meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan)

74-3003. Yamane, F.; Azuma, H.; Shimada, T.; Hashimoto, K. (Nippon Noyaku Co., Ltd., Tokyo, Japan). **[Residue analysis of isothioate (Hosdon) and its oxidation product.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 62-63; 1974.* (Japanese)

A method of determining an organophosphorus pesticide, isothioate (Hosdon), *O,O*-dimethyl-*S*-isopropylthioethyl phosphorodithioate, and its sulfone and sulfoxide residues was established. The homogenized specimen was extracted with acetone, and common salt and chloroform were added to the filtered extract. After condensation of the separated organic layer, the condensate was dissolved in *n*-hexane. Part of the hexane solution was separated by Florisil column chromatography into fractions respectively containing isothioate and its sulfone. The other part of the solution was purified by active carbon column chromatography to contain the sulfoxide only. The three fractions were respectively examined by GLC-FTD. The recovery rates of the three compounds were between 85 and 100%. The detection minima were 0.001 ppm for isothioate and its sulfone and 0.01 ppm for its sulfoxide. Generally, isothioate and its oxidation products in the crops treated with isothioate became undetectable 30 days after application. It was presumed that the sulfoxide of isothioate was decomposed within the gas chromatograph, because of its small retention time in GLC and its mass spectrum. (Lecture at XVII meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan)

74-3004. Asaka, S.; Kawachi, N.; Seguchi, K.; Izawa, T.; Sekiguchi, M. (Ageo Lab., Dept. Agr. Chem., Nippon Noyaku Co., Ltd., Ageo, Saitama, Japan). **[Residue analysis of propaphos (Kayaphos).]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 64-65; 1974.* (Japanese)

Methods for determining propaphos, di-*n*-propyl 4-methylthiophenyl phosphate, and its sulfoxide and sulfone in brown rice, rice straw and soil were examined. The established method consists of extracting the specimen with methanol, transferring to benzene, partitioning into *n*-hexane and acetonitrile, and determining the components by GLC. It was found effective to add sodium hydroxide prior to transfer and to perform the condensation under nitrogen in order to inhibit oxidation of propaphos to its sulfoxide. The usual column chromatography could not be used because of low recovery from alumina and oxidation of propaphos to its sulfoxide by Florisil, silica gel, and activated carbon. The recoveries of propaphos, its sulfoxide and its sulfone respectively were 99.5, 90.0, and 98.8-103% from fortified brown rice; 91.4, 95,4, and 94.6-99.0% from straw; and 93.4, 95.0, and 88.2-96.0% from soil. The recovery after oxidizing to the sulfone was 99.5%. The detection minima for propaphos, its sulfoxide and its sulfone were respectively 0.1 ng, 1 ng, and 1 ng. (Lecture at XVII meeting, Pesticide Research, Aug. 21, 1974. Tokyo, Japan).

74-3005. Tsujino, Y.; Yamaoka, T.; Nakamura, T. (Pestic. Lab., Sankyo Co., Ltd., Tokyo, Japan). **[Residue analysis of formothion and its intermediate metabolites.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 66-67; 1974.* (Japanese)

Methods for determining residue of formothion, *O,O*-dimethyl-*S*-(*N*-methyl-*N*-formoylcarbamoyl)-dithiophosphate, and its known intermediate metabolites dimethoate and dimethoxon were studied, and a method was established for simultaneously determining the above three compounds in several crops. The method consists of extracting the homogenized specimen with acetone, transferring to chloroform, and removing the pigment by activated charcoal column chromatography. Cleanup on a silica gel column is recommended in cases of Japanese radish, onion, eggplant, tomato, cabbage, potato, and citrus fruit, and on a polyamide column in the case of Welsh onion and determination by GC-FPD. The GC column packing used was DC 200 or DC 500, depending on the response of interfering substances. The recovery rates of formothion, dimethoate, and dimethoxone were respectively greater than 91%, greater than 97%, and greater than 82%. The detection minima were 0.02 ppm for formothion, 0.01-0.02 ppm for dimethoate, and 0.03 ppm for dimethoxon when the quantity of specimen was 50 g. (Lecture at XVII meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan)

74-3006. Sasaoka, K.; Matano, O.; Goto, N. (Dept. of Chem., Zanryu Noyaku Kenkyusho, Kodaira, Tokyo, Japan). **[Residue analysis of nicotine in crops.]** *Noyaku Kagaku (J. Pestic. Sci.) 2(2): 68; 1974.* (2 references) (Japanese)

After studying the methods for determining residual nicotine in apples and citrus fruits, a method was established in which the specimen was extracted by acetone. After evaporation of acetone under reduced pressure and addition of water and saturated NaCl solution to the residue, the water layer was extracted with ether with added aqueous NaOH solution. The condensed ethereal solution was injected into a gas chromatograph with flame thermal detector. The GC column conprised 20% Carbowax 20M plus 5% KOH/chromosorb W, AW, DMCS, with 35 ml/min of nitrogen as carrier gas. The retention time of nicotine on the column was about 4.5 min at 175°C column temperature and 230°C detector and inlet temperature. The detection minimum of the method was 0.01 ppm when the quantity of the specimen was 100 g. The average

recovery rates were respectively 97.9, 89.7, and 95.2% for the edible part of apple, the edible part of citrus fruit, and peelings of citrus fruit. Furthermore, the existence of residual nicotine was confirmed by GC-MS in fruits to which nicotine sulfate was applied. (Lecture at XVII meeting, Pesticide Research, Aug. 21, 1974, Tokyo, Japan)

74-3007. Pillay, A. R.; Tchan, Y. T. (Dept. Microbiol., Univ. Sydney, New South Wales, Australia). **Study of soil algae, VII. Adsorption of herbicides in soil and prediction of their rate of application by algal methods.** *Plant Soil 36(1): 571-594; 1972.* (17 references)

Studies were conducted to develop a simple and rapid algal bioassay technique for small amounts of herbicides in soil. The methods developed were applied to the study of herbicide adsorption by soil and prediction of herbicide application rates. Alga NMI, isolated from soil, was superior to *Chlorella* and *Chlamydomonas* species because of its fast growth rate and sensitivity to urea herbicides. NMI was suitable for assay of herbicides in soils of different pH, since inhibition varied by only 15% in the pH range from 5.4 to 8.0. Maximum inhibition occurred after 3 days of incubation. Algal growth was estimated by optical density measurements. The technique was suitable for detecting small amounts of urea herbicides and bromacil in the soil as well as for larger amounts of triazines. When the algal liquid culture technique was applied for examining the influence of soil on herbicide activity, 50% growth inhibition by monuron was obtained for alga NMI at 0.25 ppm in sand and 0.40 ppm in soil. It was calculated that 3 μg of monuron were adsorbed and thus inactivated by 2 g of soil under the experimental conditions. The paper disc algal assay was more rapid (results obtained within 30 hr) than the algal liquid assay but less sensitive. Testing of sand-clay and sand-peat mixtures by this method showed that organic matter (peat) adsorbs nearly 18 times more diuron than clay under similar conditions; more neburon than diuron was adsorbed by the same amount of peat.

74-3008. Mestres, R.; Tourte, J.; Campo, M. (Lab. de Chimie Appliquee a l'expertise, Fac. de Pharm., Montpellier, France). **Note sur la dosage des residus de benomyl, de thiabenzadole et de thiophanate dans les fruits ou les legumes, separement ou associes. [Note on the individual or simultaneous determination of the residues of benomyl, thiabendazole and thiophanate in fruits or vegetables.]** *Trav. Soc. Pharm. Montpellier 34(2): 131-140; 1974.* (10 references) (French)

Procedures for simultaneous and individual qualitative and quantitative determination of benomyl, thiabendazole, and thiophanate in fruits and vegetables are described. Benomyl and thiabendazole can be determined simultaneously by UV spectrophotometry. The minimum detectable concentration of BCM (methylbenzimidazole carbamate) was 0.5 mg/liter extract; the parent compound, thiabenzadole, at the above concentration was detectable in the presence of 6.6 mg BCM (or 10 mg benomyl) per liter extract. The determination will yield correct results only if the total optical density at 282 nm is less than 0.8 units, i.e., if the combined benomyl plus thiabendazole concentration does not exceed 10 mg/liter extract. Thiabendazole can be selectively extracted with chloroform in the presence of dimethylformamide, after which BCM, not extracted by chloroform, is extracted with diethyl acetate. Thiophanate is extracted with ethyl acetate in ammoniacal solution.

74-3009. Mestres, R.; Illes, S.; Gunther, F. A.; Ott, D. E. (Lab. de Chimie Appliquee a l'Expertise, Fac. de Pharm. de Montpellier, Montpellier, France). **Preparation automatique des extraits pour la recherche des residus de pesticides dans les eaux naturelles. [Automated extraction for the examination of pesticide residues in natural waters.]** *Trav. Soc. Pharm. Montpellier 34(2): 169-174; 1974.* (1 reference) (French)

Method and apparatus are described for the automated extraction of pesticide resdues from natural waters. The water sample to be analyzed is kept in motion by means of a peristaltic pump, and extraction is performed in a flask using sulfur ether or petroleum ether as solvents. To prevent any dissolution of interfering substances from the flexible plastic tubes by the solvent, pure water is used to force the solvents through a mixing coil filled with glass beads. A slight vacuum is used to enhance the effectiveness of the extraction. Experiments with different water samples supplied extraction rates of 100% for α-BHC and heavy endosulfan; 90% for DDT; 85% for aldrin, light endosulfan, methyl parathion, and fenitrothion; 83% for phosalone; 80% for lindane and dieldrin; and 70% for dicofol and malathion.

74-3010. Mestres, R.; Wise, J. J.; Im Udom, V. (Lab. de Chimie Appliquee a l'Expertise, Fac. de Pharm., Montpellier, France). **Dosage des residus de napropamide dans les sols et les vegetaux. [Determination of napropamide residues in soils and vegetables.]** *Trav. Soc. Pharm. Montpellier 34(2): 181-188; 1974.* (2 references) (French)

A quantitative determination of napropamide (Devrinol; (alpha-naphthoxy)-2 *N-N*-diethyl propionamide) in soil, oil-seeds, and vegetables is described. For the determination of napropamide in soil, extraction is done with methanol, followed by secondary extraction with equal ratio of petroleum ether and sulfur ether. Following elution on a Florisil column, analysis is performed on the gas chromatograph using Coulson's electrolytic conductivity detector or the rubidium sulfate thermionic detector. At a recovery rate of practically 100%, the sensitivity is 0.001 mg/kg. Napropamide

is extracted from oil-seeds and vegetables with acetone, then cleaned up by partitioning between acetonitrile and petroleum ether and by chromatographing on an alumina layer.

74-3011. Filatov, G. V.; Brytskov, V. Ye.; Kozin, V. A. (Author address not given). **Enzimaticheskiy metod obnaruzheniya na khromatogrammakh khlorofosa, sevina i ikh metabolitov, ugnetayushchikh kholinesterazu. [Enzymic detection methods in chromatograms for chlorophos, sevin, and their cholinesterase-inhibiting metabolites.]** *Tr. Vses. Nauch.-Issled. Inst. Vet. Sanit. 39: 144-148; 1971.* (Russian)

An enzymatic method was used for the detection of trichlorfon, carbaryl, and their cholinesterase-inhibiting metabolites in biological materials such as organs, tissues, and urine. Following extraction with acetone, or for urine, with chloroform, the extracts are concentrated by evaporation and applied on a chromatographic layer (silica gel for organophosphorus compounds and alumina for carbamates), using 19:1 ratio of benzene and methylethylketone for carbamates and 9:1 ratio of chloroform and methanol for organophosphates. The chromatographic layer is previously covered with chromatographic paper treated with butyrylcholine iodide, phenol red, and alcohol. The chromatogram is treated with normal horse serum prior to visualization. The presence of cholinesterase-inhibiting substances is indicated by a red color of the indicator paper, caused by a pH shift from 8 to 6.8 during the hydrolysis of butyrylcholine iodide, choline and oleic acid in the presence of serum and cholinesterase-inhibiting substances. The sensitivity of the enzyme method amounts to 2 gamma for carbaryl and to 3 gamma for trichlorfon.

74-3012. Yermakov, V. V.; Karnaukhov, V. V. (Author address not given). **Gazokhromatograficheskoye opredeleniye polikhlorkamfena v biologicheskikh ob"ektakh. [Gas-chromatographic determination of polychlorocamphene in biological specimens.]** *Tr. Vses. Nauch.-Issled. Inst. Vet. Sanit. 39: 180-188; 1971.* (8 references) (Russian)

An indirect gas chromatographic method is described for the quantitative determination of polychlorocamphene in biological materials like hen eggs and fodder. Following extraction with acetone, the solvent is evaporated, and the residue is hydrolyzed by means of potassium hydroxide in ethanol or methanol. The hydrolyzed products are extracted with petroleum ether and are detected by electron capture detector. The limit of detectability lies at 0.2 ng in 10 g sample.

74-3013. Sackmauerova, M.; Palusova, O.; Hluchan, E. (Nat. Inst. Hyg., Bratislava, Czechoslovakia). **Chromatograficke stanovenie chlorovanych insekticidov ve vodach. [Chromatographic determination of chlorinated insecticides in water.]** *Vod. Hospod. B 22(10): 267-269; 1972.* (13 references) (Slovak)

Insecticide contaminated water was extracted with petroleum ether. After partial evaporation of the solvent, the extracts were cleaned up on an alumina column; if the water was contaminated with oil or grease, the extract was first cleaned up on a standarized Florisil column, followed by cleanup on the alumina column. The chlorinated organic insecticide was then determined by gas chromatography with electron capture detector, packed with 2% QF-1 + 1.5% OV-17 on Chromosorb W, 80-100 mesh. A second determination, using thin-layer chromatography, served to confirm the identification of the chromatographic peaks and to eliminate peaks caused by the presence of biphenyls and chlorinated naphthalenes in the extracts.

74-3014. Kuehn, W.; Sontheimer, H. (Engler-Bunte-Inst., Univ. Karlsruhe, Germany). **Einige Untersuchungen zur Bestimmung von organischen Chlorverbindungen auf Aktivkohlen. [Study of the determination of organochlorine compounds on activated carbon.]** *Vom Wasser 41: 65-79; 1974.* (31 references) (German)

A quantitative method was used for the determination of organochlorine compounds concentrated on activated carbon. The technique was used in water preparation plants, and the method is especially suitable for the determination of the average, integrated organochlorine hydrocarbon load in waters. The organochlorine compounds adsorbed on activated carbon are desorbed by hydropyrolysis with temperature control, applying temperatures of 100, 200, 300, 400, and 500°C during the first stage of the pyrohydrolytic desorption, for 45 min and 700°C for the final desorption for 15 min. The organochlorine compounds are condensed and absorbed in 0.01 *N*-nitric acid for the subsequent determination by means of ion-specific chloride electrode.

74-3015. Park, Y. K.; Sontheimer, H. (Engler-Bunte-Institute, Bereich Wasserchem., Univ. Karlsruhe, Karlsruhe, Germany). **Ueberfuehrung und Anreicherung von Pestiziden aus Dioxanextrakten in *n*-Hexan. [Transfer and enrichment of pesticides from dioxane extracts into *n*-hexane.]** *Vom Wasser 41: 81-91; 1974.* (15 references) (German)

Organochlorine pesticides such as lindane were adsorbed from surface water onto activated charcoal. The pesticides were desorbed from the charcoal with dioxane, and their transfer into *n*-hexane was studied. To find the optimum conditions, it was necessary to measure the distribution ratios for organochlorine pesticides in the two-phase system. This was accomplished by analyzing the dioxane-water fraction after a second extraction with *n*-hexane, because it is impossible to analyze water-containing dioxane solutions directly on a gas chromatograph with electron capture detector. The pesticide fraction in the aqueous phase was always very low, especially when potassium fluoride was added.

74-3016. Kussmaul, H.; Hegazi, M.; Pfeilsticker, K. (Inst. fuer Wasser-, Boden- und Lufthygiene, Duesseldorf, Germany). **Zur Analytik von Phenylharnstoff-Herbiziden im Wasser. [Analysis of phenylurea herbicides in water.]** *Vom Wasser 41: 115-127; 1974.* (16 references) (German)

Thin-layer chromatographic and colorimetric methods for the determination of phenylurea herbicide residues in water samples and a screening test for aromatic amines in these samples are described. After multiple extraction and clean-up by chloroform, acetonitrile, petroleum ether, carbon tetrachloride, and dichloromethane, the purified residue is applied on a chromatographic column for purification and fractionation, using petroleum ether and then a mixture of methanol, ethanol, and petroleum ether for elution. The recovery rates range from 50 to 93% at inputs of 1-2 μg/liter. Thin-layer chromatographic determination is done by a combination of alumina-GF layer with dioxane-butylether-benzene mixture and polyamide-DC-alufoil with cyclohexane-dichloromethane mixture. The individual components are visualized in UV light, while the aromatic compounds are visualized by means of *p*-*N*,*N*-dimethylaminobenzaldehyde and hydrochloric acid. The sensitivity is 0.2 μg. Identification is possible by colorimetric method after hydrolysis of the phenylurea and metabolite residues. The aromatic amines obtained are converted to diazonium compounds by means of sodium nitrite, and stable azo dyes are obtained upon addition of *N*-(1-naphthyl)-ethylenediamine. This colorimetric method can be used as a screening test for aromatic amines, after which the extraction and clean-up are performed only in the case of positive finding for subsequent thin-layer chromatographic analysis.

74-3017. Pfeilsticker, K.; Fabricius, G.; Schulte, G. (Lehrstuhl fuer Lebensmittelwissenschaft, Univ. Bonn, Bonn, Germany). **Zur Bestimmung von Aethylenchlorhydrin in Lebensmitteln. [Determination of ethylene chlorohydrin in foods.]** *Z. Lebensm.-Unters.-Forsch. 155(5): 263-265; 1974.* (6 references) (German)

The recommended method for determination of ethylene chlorohydrin in foods fumigated with ethylene oxide has comprised extraction with acetone/water (5 + 1), then drying the extract successively with sodium chloride and calcium chloride (see abstract no. 74-0250). The possibility was examined that such drying might lead to the formation of ethylene chlorohydrin or complexation of ethylene glycol, a metabolite of ethylene oxide. Analysis of aliquots with and without this drying step revealed the apparent presence of 7-12 ppm ethylene chlorohydrin in samples which did not contain this compound, and 400-800% increases in the actual ethylene chlorohydrin levels present in others. Ethylene glycol, when present, dissolved in the discard (aqueous) phase, or was converted into the corresponding ketal in the acetonic phase. Ethylene chlorohydrin and acids catalyze this reaction. An improved method for determining ethylene oxide and its derivatives in fumigated crops (grain, cacao, pepper) was developed and will be published. Using methanol as the extraction solvent and gas chromatographic determination, recovery rates of about 85% were attained.

74-3018. Rastetter, A.; Burkart, F.; Fischer, K. (Landesanstalt fuer Tabakbau und Tabakforschung, Forchheim near Karlsruhe, Germany). **Methode zur Bestimmung von Maleinsaeurehydrazid-Rueckstaenden im Tabak. [A method for the determination of maleic hydrazide residues in tobacco.]** *Z. Lebensm.-Unters.-Forsch. 155(5): 292-294; 1974.* (2 references) (German)

A simple spectrophotometric method is described for the determination of maleic hydrazide in tobacco leaves. Tobacco leaves to be analyzed are treated with sodium hydroxide to hydrolyze the maleic hydrazide, after which rapid steam distillation is performed by means of zinc as reducing agent and nitrogen as inert gas. The distilled hydrazide is converted into a yellow-colored substance by means of *p*-dimethylaminobenzaldehyde in sulfuric acid. The colored substance is determined spectrophotometrically against a reference solution. The method is suitable for the determination of maleic hydrazide in a concentration range of 10-500 ppm. The rate of recovery ranges from 85 to 97%.

See also 74-2771 74-2803 74-2806 74-2838 74-2873 74-2887

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